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IMPERIAL MYCOLOGICAL
17 MAY 1932
INSTITUTE

THE annual volumes of Papers of the Michigan Academy of Science, Arts and Letters are issued under the joint direction of the Council of the Academy and of the Executive Board of the Graduate School of the University of Michigan. The editor for the Academy is Peter Okkelberg; for the University, Eugene S. McCartney.

Previous publications of The Michigan Academy of Science, now known as The Michigan Academy of Science, Arts and Letters, were issued under the title, Annual Report of the Michigan Academy of Science. Twenty-two volumes were published, of which those numbered 1, 21 and 22 are out of print. Copies of the other volumes are still available for distribution and will be sent on exchange as long as the editions last. Applications for copies should be addressed to the Librarian of the University of Michigan.

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MICHIGAN ACADEMY OF SCIENCE ARTS AND LETTERS

VOLUME XVI

CONTAINING PAPERS SUBMITTED AT THE ANNUAL MEETING IN 1931

(The papers in Botany, Forestry and Zoölogy of the 1931 meeting appear in Volume XV.)

PAPERS

OF THE

MICHIGAN ACADEMY OF SCIENCE ARTS AND LETTERS

EDITORS

EUGENE S. McCARTNEY
UNIVERSITY OF MICHIGAN

PETER OKKELBERG
UNIVERSITY OF MICHIGAN

VOLUME XVI

"Pusilla res mundus est nisi in illo
quod quaerat omnis mundus habeat."
— SENECA, *Naturales Quaestiones*

Ann Arbor
UNIVERSITY OF MICHIGAN PRESS
1932

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Copyright, 1932,
By Graduate School, University of Michigan
Editor, EUGENE S. McCARTNEY
Set up and printed,
March, 1932
Published April, 1932

PRINTED IN THE UNITED STATES OF AMERICA
BY THE PLIMPTON PRESS · NORWOOD · MASS.

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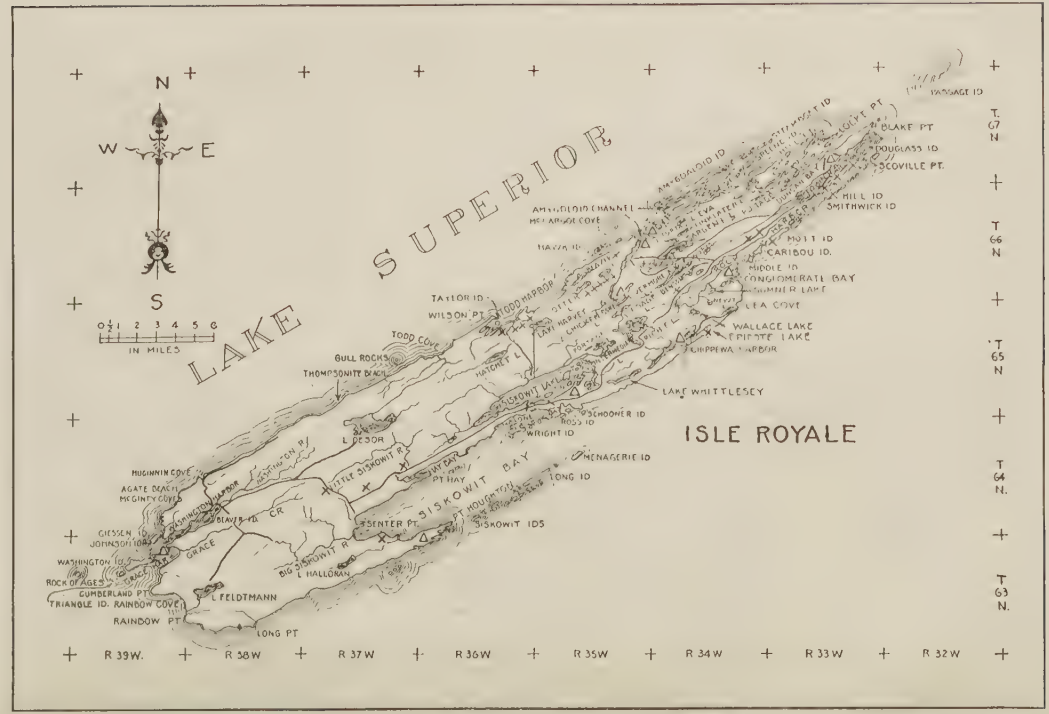
A SUMMARY OF THE ARCHAEOLOGY OF ISLE ROYALE, MICHIGAN

FRED DUSTIN

INTRODUCTORY

THIS paper, which is an attempt to give a brief statement of the archaeology of a most interesting island (see Map 1), is based on the explorations, discoveries and studies of several scientists and laymen, among whom are Charles T. Jackson, Henry Gilman, N. H. Winchell, Alfred C. Lane, Wilbert B. Hinsdale, George R. Fox, William P. F. Ferguson, S. A. Barrett, George A. West and Carl E. Guthe. I have also made use of my own observations in the summers of 1929 and 1930, which were quite extensive in the northeastern half of the Isle but, owing to the exhaustion of the fund appropriate are incomplete, especially for the Washington Harbor region, the ridges from Hay Bay to the Island Mine, the vicinity of Lake Desor, Houghton Point and Long Point. To complete the survey would require not less than four weeks; it is hoped that means may be found to close these gaps.

Much that is fanciful has been published on Isle Royale; for instance, on January 18, 1931, there appeared in a syndicate of Michigan papers a headline, "White Men Sunk Shafts in 1840." The island was not ceded by the Chippewas until 1842. In the first paragraph the writer says that "Minong" means "the good place to get copper," but it means simply "island," or more specifically, "the island." Farther on he tells us that "competent scientists have figured industriously. To scar the rock as extensively as it has been scarred would require one thousand men working ten thousand years. The hammers are of a stone not found on Isle Royale. They were brought from a distant Minnesota shore." But these fantastic statements are overshadowed by others following; for instance, "Pits, hundreds of them, containing



MAP 1. Archaeological map of Isle Royale. Explanation of symbols: ×, prehistoric mine; △, camp or village site; ~~~, trail. This map was drawn for W. B. Hinsdale's *Archaeological Atlas of Michigan* by Edward J. Stevens, from a rough draft made by the author

the almost powdered trunks of trees of eight hundred and fifty annual growth rings revealed other evidences of the working of antiquity." We may well wonder how the growth rings of "almost powdered trunks" could be counted. Some years ago a section of a fallen pine *was* cut and about two hundred and fifty rings we counted, but not over "hundreds of pits."

When the imagination is allowed to run riot, figures lose their value and alleged facts must be greatly discounted. To the archaeologist, Isle Royale is a fascinating field which needs no resort to fable to deepen its interest.

PREHISTORIC COPPER MINES

Beginning at Washington Island, at the southwest end of Isle Royale, with its surrounding islands and rocks such as Triangle Island, we find native copper outcropping, and wherever the white miner has worked the Indian miner has worked before him. Along the north shore northeasterly from Washington Harbor the archaeologist has not explored to any extent until Todd Harbor is reached. Here, near the beautiful little falls that marks the entrance of Hatchet Creek into the harbor, and northeast along the ridges, there are still to be found several prehistoric works as left by the ancient miners, but others have disappeared through the labors of their white successors.

There are also indefinite reports of old pits near the shores of Lake Desor, and it seems probable that exploration would reveal them.

Continuing northeast we come to Hawk Island, and here, on the mainland of the Isle, considerable work was done by white miners in the late 'forties and early 'fifties of the last century, presumably on prehistoric locations. Passing McCargo Cove for the time being, we do not find much of interest until we round the head of the Isle and arrive at Scovill Point, called by the early explorers "The Fore-Finger," referring to the four points or "fingers" characterizing the northeast end.

Not far from the end of Scovill Point and thence southwest for five or six miles the rock was pitted in many places by the red

miners, and some of their work may still be seen near the trail which runs southwest from the end of the point past Rock Harbor Lodge, where some years ago a mass of copper weighing thirty-five pounds was removed from beneath a slab of rock. On Minong Island, the location of Minong Lodge, which was built many years after all mining ceased, a very heavy piece of copper was extracted from the loosened rock while leveling was being done for the foundation.

At the old Siskowit Mine opposite Mott Island there may still be seen the shallow pits and the stone hammers of the primitive workmen. On Hill Island and Mott Island old diggings remain. In the early days lumps of copper were collected from the small beaches and even now the tourist picks up pebbles of prehnite and small masses of quartz mixed with other minerals, which show bright surfaces of copper here and there or small specks of that metal imbedded in the matrix, and we may know that the Indian miner was not slow to collect in this way, for the very earliest accounts mention this "float copper" as a source of supply.

Passing southwest through the Middle Islands Passage at the Old Light and on to Chippewa Harbor, the voyager by boat will note many places along the shore where mining operations were carried on by whites, and the traveler along the ridge a little back from the water will see signs of prehistoric mining.

Beyond Chippewa Harbor there are comparatively few workings to be seen until the vicinity of Hay Bay is reached. A half-mile north of the outlet of Little Siskowit River at the falls, William P. F. Ferguson discovered some prehistoric mining pits on a rocky salient of an ancient lake beach, which from its general appearance led him to believe it to be a rudely constructed fort, but a study of remains shows the true character. Across the river to the southwest he observed many shallow pits which he thought were ancient pit-dwellings; there is evidence that they were simply holes dug by white miners testing for bedrock along the old beach.

About two miles southwest of the falls along the ridge Ferguson found other prehistoric pits which had been partly destroyed by mining, probably by workers at the Island Mine to the northwest. South of these pits I found and reported a large group, which were

undisturbed, except for a short trench through a pile of waste rock and earth. A rough count gave the number as twenty-seven, but it is quite possible there were more, for my examination was cut short by approaching darkness.

From the site of the old county seat at the head of Siskowit Bay, running almost due northwest two miles, are the remains of a road built to the Island Mine, which operated in the 'seventies. The several shafts were located on old Indian pits, one or two of which may still be seen near the first shaft. Not far beyond the last shaft the earliest surveyors who made a record of their work found a clearing of an acre or more and full evidence of a primitive "sugar bush." A fine growth of hard maple extends along the ridge.

We shall now return to McCargo Cove, but instead of passing around the northeast end of the isle, will follow a different route. There are good reasons for believing that most of the ancient miners came to Isle Royale by way of the Keweenaw Peninsula, following the shore in their canoes from the vicinity of the present Portage Lake Canal to near Eagle Harbor, thence directly across to Houghton Point. With favorable weather it would not be difficult to traverse this distance between rising and setting suns, or, in summer, in a much shorter period.

Probably many voyagers would set their course directly for Chippewa Harbor, forty-five miles from Eagle Harbor, and only two or three miles farther from the nearest point on the peninsula than Houghton Point. Arriving at Chippewa Harbor, they would rest all night at the village site on the Narrows. From Chippewa Harbor there was a portage of about one and one-half miles to Lake Richie, which was crossed to a half-mile carry to Lake Le Sage.

From the north shore of Le Sage, another portage of a half-mile to Lake Livermore, crossing which they would come to a very short carry to Chickenbone Lake, thence to the outlet with another short portage to the head of McCargo Cove.

Southwest of the upper end of McCargo Cove, and a mile distant, are the large open cuts, shafts and rock piles of the Minong Mine, which produced about one half of all the copper obtained

by the white miners from Isle Royale, and here also the prehistoric workers operated for probably hundreds of years. The first primitive mine noted is about forty rods southwest of the old Minong Mine landing, marked by a few submerged logs still to be seen in the clear water near the head of the cove. From the first pit southwestward the workings increase in number to just beyond the Minong Mine, where they are so numerous that they overlap and run into each other; the worked-out pits were filled with the waste from adjoining ones. It is not improbable that there were two thousand or more of these tiny individual mines at this locality, since the workings extend half a mile beyond the Minong Mine to the southwest, although scattered excavations may be seen farther along the side of the ridge toward Todd Harbor.

The rock that bears the copper seems to be a brecciated conglomerate, but looks as though it had been cemented by heat instead of aqueous solutions. Some interesting minerals were noted on the great dumps of the Minong Mine, such as calcite crystals of several shades, masses of quartz crystals, manganese ore and curious incrustations of small red crystals said to be gypsum, also a small disintegrating rock mass containing numerous altered chlorastrolites.

There is a good trail from the Cove to the mine, but if one wishes to study the ancient workings he should not follow the path, but bear to the right at once, ascending the side of the ridge to an irregular terrace, where the first pit will be found; others farther on will lead to the north of the mine dumps and mine.

Visitors should not fail to ascend the cliff north of the largest open pit to Arthur's Lookout, where a grand panoramic view of island and lake is obtained. From this point, on the very crest of the ridge, one follows northeast for some distance, descending about fifty feet to the foot of a low ledge, where a small prehistoric mine may be seen which was noted on my last visit. With this exception the crest of the ridge seems to be barren of copper; the great deposits are on the south slope.

Large masses of the red metal were found in mining days; one had been uncovered by the Indian miners and projecting pieces broken off. It weighed over two tons, but the great nugget

was far too massive to be of use to them, and later became the prize of their white successors. A picture of it from a photograph appears in W. B. Hinsdale's *Archaeological Atlas of Michigan*,[1] p. 25.

If the visitor has sufficient time and wishes to trace the copper outcrop to the southwest, he may follow the route of Dr. Adolph Murie and myself along the ridge, passing between Lake Harvey and Todd Harbor to the outlet of Hatchet Lake, distant about seven miles. The last half of the way is rough traveling, but views in the vicinity of Todd Harbor will well repay time and effort spent.

We may now mentally picture the Indian miner of long ago. We have seen him on his voyage across Superior and over the carries and through the lakes to Minong Mine. He has slowly and patiently hammered out a few pounds of the treasured metal and the summer is drawing to a close. A friend or perhaps a brother has been mining near the tip of The Fore-Finger and our red friend wishes to join him there. He loads his birch-bark canoe and paddles down to Birch Island near the foot of the Cove or to Indian Point just north. A "northeaster" has started to blow, raising too great a sea for him to venture forth on the great water; also the day is far advanced and the safer inside passage to be described later is feasible only in daylight, and so he camps for the night on grounds where for generations before him other ancient miners have built their fires. Here for a time we shall leave him.

TRAILS

In moving from place to place men and beasts naturally follow the lines of least resistance, whether having a definite objective or not. This is strikingly illustrated by the old trails on Isle Royale, and since there are no roads on this island the trails once trod by the Indian are now the highways of the white man and the moose, often well worn and leading by most direct routes to lake and cliff, to ancient mine and present-day camp or cabin. (See Map 1.)

[1] Published by the University of Michigan, 1931.

Beginning opposite Minong Lodge on The Fore-Finger, a trail ran southwest, following the shore to the head of Rock Harbor, thence to Lake Richie, where it crossed the carry-trail from Chippewa Harbor; on to the outlet or Narrows of Wood Lake, thence to the shore opposite Malone Island, west to the outlet of Siskowit Lake, southwest to the falls of Little Siskowit River and on to the prehistoric mines near the old county seat. From this point it turned due northwest to the maple ridge and sugar bush, then two miles west to Washington Creek and down the ridge to Washington Harbor, near where the club house now stands. Across the head of the harbor another trail started, running to Huganon Cove and making an angle to the northeast; it followed the shore four miles or more.

There was also a trail that led from the old Indian village site at the Narrows of Chippewa Harbor to Lake Mason and farther to Lea Cove.

On Rock Harbor, at the outlet of Lake Benson and directly opposite an ancient camp site southwest of the Old Light, a trail began which extended west to McCargo Cove, crossing Sargent Lake at the Narrows. Half a mile west of the Narrows this trail was joined by one which started at the head of Tobin Harbor and ascended the Greenstone Ridge to what is now called Mt. Franklin, where a magnificent view is obtained of lake, forest and islands.

From Mt. Franklin it followed the ridge southwest to a point where Sections 15, 16, 21 and 22, T. 66, R. 34, corner, and then bore west and south around Sargent Lake. From the section corners noted a branch trail continued a mile farther southwest, joining the trail to McCargo Cove near the head of Angleworm Lake.

During the summer of 1929 a member of a party that I accompanied to Mt. Franklin picked up a very fine copper knife on this trail just below the summit.

Two or three other short trails will be mentioned later.

VILLAGE AND CAMP SITES

Of village sites (see Map 1) there were none which were permanent in the same sense as those of lower Michigan. Isolation,

climatic conditions and a possible lack of or difficulty in procuring food supplies in winter made it, even as it is now, a place of summer resort, but to the red man it was also a valuable source of treasured metal. At Washington Harbor, on the northeasterly extremity of Grace Island, a village existed, and it seems there was another one across the channel on the mainland of the Isle. At Fisherman's Home, which is situated on a little bay a mile southwest of the tip of Houghton Point, there was a village, and on the south shore of Siskowit Lake one-half mile southeast of Ryan Island a camp site has been reported.

On the south side of Rock Harbor and one-half mile southwest of the Old Light relics have been collected from a spot which the surveyors in 1847 observed was still a camping ground for Indians. At the Narrows in Duncan Bay there is a small shelf of land that nestles at the foot of the cliffs, where in 1927 a stone pipe was found. In 1929 I did a little digging at this place and uncovered an ancient firebed with its attendant remains of charcoal, bones and fire-cracked stones.

As might be expected, the most extensive village sites were at each end of the great highway to McCargo Cove. One located at the Narrows of Chippewa Harbor on about two acres of fairly level ground was examined with some care by the McDonald-Massee Expedition in 1928, by me in 1929, and by Dr. Carl E. Guthe of the University of Michigan in 1930. Good collections of potsherds, animal remains and artifacts of stone and copper were made by all.

At Birch Island near the mouth of McCargo Cove small collections were also made by them.

On Indian Point a short distance north of Birch Island, a village site was reported by me in 1929 and explored by Dr. Guthe in 1930, and some interesting discoveries were made. These three village sites are of great interest and serve as keys to unlock the story of how the prehistoric miners came to their great mining center near the head of McCargo Cove, sojourned there and departed.

ARTIFACTS AND OTHER RELICS

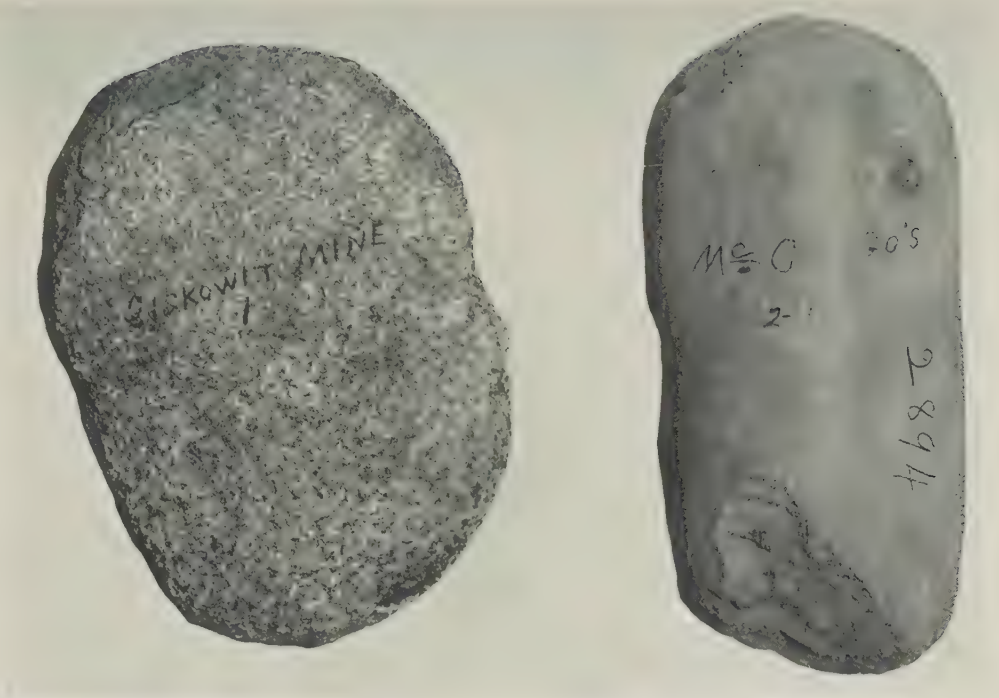
The collections from Isle Royale are comparatively meager. Occasionally an arrow-point has been found, a stone celt or axe discovered, and at least two caches of copper implements have been obtained, but, in general, articles formed by the human hand are scarce.

There is one class of relic, however, of which hundreds may be collected, but only rarely do they show any indications of having been "manufactured." I refer, of course, to the stone hammers used in beating out the copper from the rock (see Pls. I–II). These hammers were simply boulders, natural masses of rock rounded and smoothed by wave action, many of them transported to the Isle by the great ice-sheet, distributed on old lake beaches high above the present lake level and left undisturbed for ages until the red miner came and made ample use of them. Of the hundreds I have seen only two were slightly grooved, and one of these was for domestic use. These hammers plainly show the uses to which they have been put, one end invariably being battered or spalled; sometimes both were. A few are of native rocks which have undergone the grinding and polishing process on their own beaches, but hard, tough stone like granite or syenite from the Canadian mainland predominates.

In the newspaper article noted in the introduction it was stated that these stone hammers were brought from Minnesota. Others have said they were systematically conveyed from the Canada shore, a striking contrast between fact and fiction.

I have seen an undisturbed pile of these used hammers covered with lichens, which are of rather slow growth. Perhaps they have remained in their present situation for several centuries. Any estimates of time are mere guesses, but it may be safe to say that these mines were worked hundreds of years before Columbus sailed away to the west.

In studying the trails I have been impressed by a thing of considerable significance, namely, the finding of relics on them far from camp sites or termini. One is sometimes asked, "How do you know that a trail existed as you describe it?" A very reasonable question.



Two grooved hammers, much reduced in size, of a type very rare on Isle Royale; now in the University of Michigan Museums. Collected by the author

Stone hammers, much reduced in size, typical of those used by prehistoric Indian miners; now in the University of Michigan Museums. Collected by the author

When the Government surveyors made the linear survey, they were required to enter on their field notes all trails crossed, with their distances from established marks, their bearings and other data. They were required to note village sites and other evidences of previous occupation. In addition to this, early explorers found these trails very convenient highways and used them frequently. The ethnologist also knows that the American Indian had certain characteristics which give the trained mind valuable clues. He knows that the Indian sought out and discovered points of vantage from which he had unobstructed views. He did this for two reasons: he was an ardent lover of nature and realized that he was a part of it; also his caution and natural desire to locate his position were strong factors in his seeking heights. It was, therefore, no surprise to me when my friend found the copper knife on the trail to Mt. Franklin, for we were following the path that the Indian naturally took to attain the summit. I picked up a crude grooved implement on the Rock Harbor Trail not far from the Siskowit Mine. In 1928 an arrow-point was collected on the trail midway between the head of Rock Harbor and Lake Richie. Some years ago John Linklater found on the Sargent Lake Trail a fine knife made from white chert.

The finding of these articles is only added testimony as to the location of these primitive highways, and proof of the passage of men to and fro.

COPPER IMPLEMENTS

Two caches of copper artifacts have been reported, one from a rock shelter on the west side of the neck of water connecting Wood Lake with Siskowit Lake and another at the Minong Mine at McCargo Cove.

Two small copper knives were secured by Dr. Guthe in 1930 from the village site at Chippewa Harbor, and one or two other copper articles have been mentioned from the same place. Others have been secured at Birch Island.

POTTERY

The question "Who were the ancient miners?" has been an interesting one, and some rather grotesque theories have been

advanced, such as Aztecs from Mexico, Indian slaves of southern Indians, or supposedly civilized mound-builders of Ohio. The mysterious and improbable seems to have a stronger hold on the minds of many people than the obvious and natural. In science, at least, sane common sense is useful, and if we make use of previous observations it often happens that theorizing is unnecessary; it would appear that the query about the old miners is answered, at least in part, by the remains they have left.

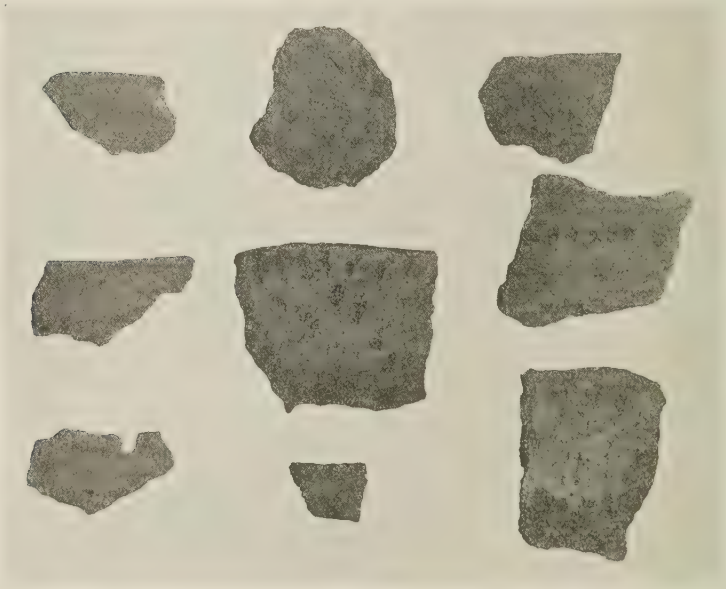


Fig. 1. Pottery sherds from Chippewa Harbor village site; now in the University of Michigan Museums. Collected by the author

Archaeologists have agreed that pottery is a fairly good key to the different cultures characterizing the several linguistic stocks, for there are certain unmistakable "hall marks" which are Algonquian or Iroquoian, for example. For these reasons some of

us have collected these fragmentary remains with eager interest. The McDonald-Massee Expedition obtained about fifty potsherds in 1928, Dr. Guthe nearly a half-peck in 1930, half coming from Indian Point and most of the others from Chippewa Harbor. In 1929 I collected over sixty pieces, all from Chippewa Harbor (see Fig. 1).

A study of these collections would indicate that nearly all the pottery collected was purely Algonquian, with a very few pieces of Iroquoian culture.

In my manuscript report of the preliminary archaeological survey made in 1929 for the University of Michigan, I endeavored to trace the course of the prehistoric miners on their journeys to and from the Isle. My conclusions were that the copper was mined by the ancestors of Indians still living; that they were of the same cultural condition as those shrewd redskins who told the Jesuit fathers that this wonderful island alternately appeared and disappeared; who related its awful dangers or mysterious phenomena.

Their stories had some foundation in fact. A few weeks spent on Isle Royale will convince even an incredulous person that in the strange "tides," the mirage, the awe-inspiring rocks, the wild forests and deep cold waters there is something that reaches to the depths of a thinking man's being. It teaches a lesson of the marvel and majesty that appealed to the ancient miner even more than it does to us.

HUMAN REMAINS

In 1908 the children of E. T. Seglem discovered a sort of cave not far from Fisherman's Home on Houghton Point. It was partly closed by rough stones, the removal of which revealed a quantity of human bones. On examination it appeared that at least thirteen persons were represented by these osseous relics. What happened to those ancient voyagers is a matter of interesting speculation, but of course must remain unknown. The skulls were identified by competent authority as Indian. So far as is known these are the only prehistoric skeletal remains that have been found on the Isle.

GEOGRAPHY

Isle Royale presents a series of ridges running from northeast to southwest, with deep valleys between. Except at the southwest corner beginning at Houghton Point and Siskowit Bay, where a hard sandstone is the prevailing stone, the island is a great upheaval of lava-formed rock, precipitous on the northerly side but more gently sloping southward.

The drainage in general follows the lines of the ridges, except the break beginning at Chippewa Harbor and ending at McCargo Cove, which has been described as a fault by some geologists.

There are more than fifty inland lakes of which the largest, Siskowit, is about seven miles long by nearly two miles wide. Most of these lakes are long and narrow, but a few are of odd form, for example, Chickenbone, Angleworm and one or two others; their peculiar outlines give them their names. Most of the lakes are of considerable depth; Siskowit has one sounding of 142 feet, and a tiny lake into which Lake Whittlesey drains is 22 feet deep.

There are scores of surrounding islands, especially around the northeast half, with deep narrow harbors and channels much like those of Maine and Norway. These, in connection with the long fingers, have formed sheltered passages to be further described.

CONCLUSION

Let us return to our Indian miner in camp on Birch Island. The berries of the mountain ash are red and the early frosts are dyeing the leaves with autumnal tints. Far out beyond the reef that marks the entrance to the Cove, he sees the white waves rolling high; he knows that his frail canoe cannot breast them. He cannot even venture into Amygdaloid Channel, for there, too, the northeast gale has full sweep. But there is a safe passage, so that at early morn we see him in his laden canoe paddling into a little bay northeast of the Cove, where by a portage of only a few rods he finds a sheltered passage through Pickerel Cove, thence to Lane Cove, from which by another very short portage he passes to Stockly Bay, and has some difficulty for a mile, for here

there is a little exposure to the wind. Another troublesome but not long carry sees him in Duncan Bay, down which he paddles a mile and a half to the Narrows, where he lands at the little camp site. Beyond, the heavy seas, dead ahead, forbid farther progress, so here he must stay unless he makes the hard portage of a mile over the Greenstone Ridge to Tobin Harbor. The latter alternative is chosen. In due time he launches his canoe in Tobin Harbor opposite Minong Island and proceeds southwest to a trail running to Monument Rock, for he cannot pass this weird and awe-inspiring formation without paying his respects to its supposed powers. Had he time, he would follow this trail to the cliffs now called Lookout Louise, where a grand scene lies before the observer.

He returns to his canoe and paddles up the harbor to a neck of land where now stands Rock Harbor Lodge. Another portage and he enters Rock Harbor. That night he camps near the Old Light where now the fishermen's cabins stand, protected by the Great Indian Head, its features formed in rock, the subject of legend, story and poem.

The gale does not blow out for another day, but as it dies down he starts again on his voyage, for he well knows that soon a stiff breeze may spring up from the southwest. We see him following the shore to Wright Island, from there, the wind still favoring, he makes the long push to Houghton Point, where at Fisherman's Home we will leave him for the time being. The friend he had expected to meet on The Fore-Finger has secured his share of copper, but his food has run low, and so he has gone to the favorite grounds of the moose, Lake Richie, carrying over the two miles of trail from the head of Rock Harbor. A moose calf soon falls before his flint-tipped arrow, and after a day spent on the shores of Richie, he paddles to its western extremity, from whence he portages to Intermediate Lake, distant a short half-mile. In that far-off day Siskowit Lake waters were several feet higher than at present, and Intermediate Lake, like Wood Lake, was connected with Siskowit by a channel of dead water, so that our Indian paddles on to the outlet of the latter, where a half-mile carry brings him to the shore of the great water.

From this place he follows the same course to Houghton Point by way of Wright Island, over which his friend has passed, and at Fisherman's Home finds him waiting.

They have not voyaged alone, but wife, son or brother has accompanied them. They now await a fair day to cross the forty miles to Keweenaw. It comes, and we see their barks speeding over the waters until lost in the distance.

Thus we part with our red miners. They have left behind them their works but have taken with them their product. In years to come the white man will marvel at their labors, and as he picks up a copper spear on the fields of Michigan will speculate as to its origin and endeavor to trace it to its source.

Saginaw, Michigan

METHODS OF INDIAN BUFFALO HUNTS, WITH THE ITINERARY OF THE LAST TRIBAL HUNT OF THE OMAHA

MELVIN R. GILMORE

IN ANCIENT times and even comparatively recently, since buffaloes have been destroyed by the white men, the buffalo hunt was one of the most important industries of all the tribes residing within the range of these animals. The products from the buffalo supplied the people with food, clothing, shelter, various useful implements, instruments and utensils, glue and other commodities.

Among the Pawnee, Omaha and other agricultural tribes in the region of the Missouri River there were two tribal buffalo hunts each year, one in summer and one in winter. The summer hunt was made after the cultivation of the fields had been finished and was concluded in time to return home when the new corn was ready to eat and to preserve for winter provision by drying. The winter hunt was made after the crops had been harvested and securely stored. When it had been concluded the people did not return home *en masse;* they frequently divided into smaller parties and scattered over the milder parts of the tribal territory for the purpose of trapping and hunting smaller game and for securing other desirable commodities, or they made trading expeditions to neighboring tribes whose country might supply desirable natural products not found in their own. They might return soon or late, but at all events they planned to be back home in good time to prepare for the spring planting of their crops.

While out on the campaign of the buffalo hunt, away from their houses in the home village, the people lived in conical tents. The name of this tent, "tipi," is adopted into the English language from the Dakota language. In passing, it would be well to note

that the word "wigwam" does not apply to the form of habitation to which we have referred by the name "tipi." The word "wigwam," which is adopted from an Algonquian language, denotes a different structure. A wigwam is a dome-shaped shelter which is constructed by making a frame of poles, bent to meet in the form of arches, upon which is laid a covering of mats or of bark.

While on the buffalo hunt, or any other tribal expedition, the people camped in a circle in a certain order, which was prescribed by tribal law and custom. In the Omaha tribe there were ten divisions or gentes, and each gens had its proper segment in the tribal camping circle, and each family of a gens had its own place in the particular segment pertaining to its own gens.

The buffalo hunt was a serious undertaking, a communal industry, and on it depended to a great extent the happiness and welfare, even the life, of the community. Because of its vital importance the hunt was begun and carried on under religious auspices. Its activities were pursued under order and discipline as strict and rigorous as those of any military expedition. For the duration of the hunt chiefs as well as common people were subject to the control of a high officer called the director of the hunt. To his commands all persons must give the most exact obedience. This office was one of the gravest responsibility and of correspondingly high honor. The people realized that their welfare and safety depended upon the strictest obedience to the orders of the director, and upon his foresight, prudence and vigilance.

In the Omaha tribe, when a buffalo hunt was to be made, the tribal council of governing chiefs was called to consider and adopt the plans of the expedition and to appoint the director. The direction to be taken by the expedition was determined by general knowledge of the usual resort and movement of the herds at the season of the year. This knowledge of the habits of the animals had been gained by the experience and observation of the naturalists of the tribe. For the particular route of the expedition two most necessary items must be considered, wood and water. From these considerations it may be seen that an adequate

knowledge of the geography of the region was an essential requirement in order that a route might be chosen with the utmost directness consistent with keeping in touch with these necessities and with regard to the ultimate object of contact with the herds. With the work of striking camp, packing and moving on with all the camp impedimenta, care of children and other details, and the pitching of camp again, the daily distance marched was about ten or fifteen miles. The distance and the place where the camp was to be made each day were ordered by the director and proclaimed by his herald. He determined the location of the daily camp from considerations of distance, terrain and gradients *en route,* and necessary wood and water convenient to the place of making camp. Before making his decision on this point he sought advice from the council of the women, for the household work and care of the children were comprised in the functions of the women.

The director appointed a number of men from among the bravest and most sensible of the tribe to be marshals. Their duties were to keep all persons in order and see that the commands of the director were promptly executed, to prevent noises which might stampede the herd and also shouts or loud calls, the barking of dogs or neighing of horses, and to hold all persons in check when the approach was made toward the herd and until the signal was given for the attack. The instructions to the marshals were: "You are to recognize no persons or relations in performing your duty — neither chiefs, friends, fathers, brothers nor sons."

The director also appointed a number of reliable, strong, active young men for the arduous and often dangerous duty of scouting ahead each day to find the herd and report to him its whereabouts. When the herd finally was discovered the proper religious observances and other preparations were made, and various persons were assigned to their appointed stations according to their several abilities. Strict order was maintained for the sake of efficiency and to prevent unnecessary hazard in what was at best a rather dangerous work. It was a community industry and all persons shared in the work and in the products. Active

men, good riders and bowmen, were told off to surround the herd and gradually to close in upon it from all sides. At a given signal the slaughter began. The helpers now hastened up and began the work of flaying and butchering. Portions were divided among them in the order of arrival; the most desirable ones belonged to the first to arrive and begin their work on a carcass; every animal was cut into certain portions according to recognized custom and law. Each bowman had his rights in every animal slain by him whether he himself had a hand in the butchering or not. The slayer's rights were determined by the arrow shown to have been lethal. Since all arrows bore the private marks of their owners, this evidence was conclusive.

The man who had slain a buffalo had proprietary right to the hide, brains and one portion of the meat which lies between the ribs and the breastbone. This part of the carcass made two portions, one on each side of the breastbone. Whether the slayer of the animal had any more than the hide, brains and one of these two portions of meat depended upon the number of helpers who took part. The number of helpers might be large enough to require all the other parts for their payment. The shares received by the several helpers were adjusted, so that each one received something for his services.

The portions made in cutting up a buffalo carcass as recognized by custom were the following: the part already mentioned, of which there were two portions; the hindquarters, two portions; the ribs, two portions; the brisket, one portion; the hip bones and tail, one portion; the backbone from hip to shoulder, including the "hump," which was a choice part, together with the two loin muscles, the sirloin and sinew, one portion; the neck and all the vertebrae from the shoulder to the head, one portion; the head and tongue, one portion; the smooth tripe, heart, lungs and kidneys all together, one portion; the honeycomb tripe, leaf fat and entrails, one portion.

To save unnecessary weight in transportation, the bones were cleanly stripped of meat and left lying on the field of slaughter on the prairie, except those which were required for some utilitarian purpose. Some bones were useful for the manufacture of certain

articles, and the leg bones and the backbone were valued for the marrow which they contained, which was a very desirable titbit. The marrow was obtained by breaking these large bones with stone sledge hammers. These bones, with the adhering bits of meat and the marrow, were employed in making soup or for roasting. All useful odd bits which could not be dried for the future were at once utilized for food in the field while the work went on of preparing the products for transportation home. This work of preparation and preservation consisted in drying the store of meat, rendering the fat to tallow, and the packing of both these commodities in cases for transportation.

All the meat which was suitable for drying was at once cut into thin strips and suspended in the sun and air on poles or thongs. In thinning the pieces of meat a transverse cut was made midway between the ends of the piece, almost but not quite through. Then the knife was laid flat and a longitudinal cut was made under each half, from the transverse cut almost to each end of the muscle. Next the thick portion was turned over at the end, and this undercutting was repeated until the original chunk was thinned and elongated into one strip. After the meat had been thoroughly dried it was packed into cases made of hide. The fat was rendered and the tallow was poured into receptacles while warm. As it cooled it hardened and took the form of the receptacle. When the dried lean meat had been packed warm tallow was poured in to fill all the crevices and effectually to seal the mass of dried meat, thus helping in its preservation.

Packing cases were made of standard size; the dimensions were a length of two cubits, a width of one cubit and a thickness or depth of one cubit; the measure of a cubit was the length of a person's forearm from knuckles to elbow. A case of these dimensions had been found by experience to be the most convenient and practicable for transportation by packsaddle on horses. So this quantity of dried meat had by custom come to be a recognized unit of measure in intertribal commerce and therefore had its price as such in trade for other commodities.

Almost every part of the buffalo served some human use. The flesh and fat were of prime importance for food, but the hide,

horns, bones, sinews, hoofs, brains, hair, teeth and other parts had many and various uses. The hides taken in winter were used, with hair left on, for robes and bedding, for winter moccasins and other things; those taken in summer were depilated and used in making tent covers, clothing, ropes, moccasins, packing cases, knife scabbards and various utensils, as binding for the hafting of tools, for making the round skin boats employed in crossing streams, for manufacture of horse gear and for many other purposes.

Bones had many uses. The shoulder blades were suited to make hoes and squash knives. Dentate chisel-like tools made from shank bones served for dressing hides to be tanned. Ribs were used in making coasting sleds for small boys. The ice-glider, an instrument employed in an athletic game of skill played on the ice, was also made from a piece of rib. An arrow-maker's tool for gauging and straightening arrow shafts was often made from a buffalo rib. Spades and hoes were often shaped out of a part of the frontal bone of a buffalo skull.

Certain bones were used in the building of saddle-trees. Knife handles were made from ribs and from spinal processes. Spongy ends of some of the large bones were cut out to make instruments for applying the mineral paints in the painting of decorative designs on packing cases, tent covers and other surfaces. The porosity of this spongy substance made it a good medium for carrying the pigment, and its rough, abrasive texture was suitable to the purpose of preparing the surface of the hide to receive the paints and of applying the coloring matter.

The long tendons were carefully taken out whole, so that the full length of the fibers of the sinew should be preserved. Thus the long sheets of sinew of the loin muscles were removed by steady, gradual pulling by means of strong thongs tied to the ends. This sinew was then macerated and the fibers hand-twisted into thread and all kinds of cordage, for bow cords, and for binding spear points and arrow points to the shaft. It was also used in attaching arrow plumes and in the hafting of tools.

The brains were carefully removed from the skulls and saved for use in the processes of dressing the hides in tanning.

The horns, too, had their uses. From these were made spoons, drinking cups, the heads of war clubs, spinning tops for small boys, and cupping horns for the use of their physicians in a manner similar to that formerly practiced by white physicians in the bleeding of patients for the relief of congestions.

The thick skin of the forehead, the muzzle and the hoofs of the buffalo were used to make glue. This glue was employed in the mounting of points on the arrows and in attaching their plumes, and in many other utilities in which an adhesive was required. To make glue the parts named were boiled down to a gelatinous mass, meanwhile being skimmed until the clear glue remained. The glue was now dipped on sticks and packed for use at need. Slender sticks of convenient length, about the length of the forearm, were dipped in the warm glue and twirled about until the adhering glue stiffened in cooling; this was repeated until a knob of glue about as large as the thumb adhered to the end of the stick. Then another stick was taken, and another lump of glue was formed, and so on till all the supply of glue was thus conveniently disposed for storage. When the glue was required for use the worker needed but to heat a pot of water in which to moisten and soften it as he worked. When he was through, any glue remaining of the lump was cooled and stiffened, after which it was ready to be stored away again.

The long hair of the buffalo was twined into yarn to weave into beautiful bags suitable for many purposes, especially for the wrapping of sacred bundles and other sacred objects, and for the weaving of sashes for personal adornment. Beautiful ropes were also made by braiding twisted strands of buffalo hair for the lashing of bundles of valuable materials. Buffalo-hair rope was also used for ceremonial purposes, such as equipping and leading the horse on which a bride was carried forth and presented to a bridegroom.

The paunch and bladder were cleaned and made into liquid containers, as water bottles and so forth. Bladders served as bulbs for syringes used by their physicians, the nozzle of the syringe being formed from a hollow bird bone of suitable length and diameter; or it might be fashioned from a piece of stem of elderberry bush from which the pith had been pushed out.

The teeth of the buffalo were turned to account for the making of beads and pendants. The tuft of the tail was often used for sprinkling water on the heated stones for the vapor bath in the steaming bath lodge, which was equivalent to our modern steam bath cabinets.

Even the ordure of the buffalo was valuable. Out on the dry, grassy plains, far away from any timber, the dried ordure was the only fuel. Since the modern disappearance of the buffalo and its replacement by European cattle the white cowboys have commonly used "cow-chips" for fuel just as Indians used "buffalo-chips." Indian mothers of young infants also found a good use for dried ordure of the buffalo. They had no cotton fabrics as white mothers have for sanitary use in the care of their infants, so the ingenuity of Indian mothers had to find other expedients. In regions where there were extensive marshes in which the cat-tail abounded, the cat-tail down was gathered and stored for such use, and when needed was felted into sanitary pads. But out on the high, dry plains this resource was lacking. Even here the Indians' powers of intelligent observation, ready perceptiveness and independence in overcoming difficulties found a means to supply the need. Old "buffalo-chips," thoroughly weathered and washed by rains, dried by the sun and wind, oxidized by the air, were gathered and pulverized. This substance, soft as down and in a high degree absorbent, served excellently for a sanitary material.

From the foregoing review the reader will readily perceive the position of economic importance which the buffalo held in the material culture of the Indians of the Great Plains.

By intertribal treaty regulation the Pawnee and the Omaha enjoyed reciprocal privileges of hunting in each other's country, for the migratory habits of the buffalo sometimes brought about the temporary abandonment of one country or the other by the herds. If the Omaha scouts found that the herds had left their country and had gone into that of the Pawnee, then the Omaha chiefs reported to the Pawnee chiefs and asked the privilege of following the herds into their country. Under their treaty agreement this privilege would be granted with the stipulation that

Pawnee officers should direct the hunt. Likewise, when the Pawnee desired to hunt in the Omaha country they could obtain that privilege, with the hunt directed by Omaha officers.

But the advent of the white man, his encroachments upon the Indians' grazing lands and his wanton and unjustifiable slaughter of their herds compelled the Indians to make longer and longer excursions each year in quest of supplies, and with continual and rapidly diminishing returns, until finally they found the buffalo hunt to be an entirely profitless venture. The last tribal buffalo hunt attempted by the Omaha was made in the month of December in the year 1876. I obtained the following account of the itinerary of that expedition in October, 1912, from Francis La Flesche, who was a member of that campaign.

In 1854 the Omaha nation by treaty ceded to the United States all their tribal territory except a reservation adjoining the Missouri River in the northeastern part of what is now the State of Nebraska and comprising an area which now forms the county of Thurston and a part of Cuming County. From their former villages on the Papilion Creek, a few miles west of Bellevue, the Omaha removed in 1854 to this reservation. Here they built their three new villages in the shelter of the timbered hills not far from the river, about six or eight miles east of the present town of Walthill and a few miles north of the place where Macy is now. In these villages they lived until the tribe was scattered over the reservation by the allotment of lands in severalty in the eighth decade of the nineteenth century.

The Omaha were living in these villages near the Missouri River when, in December, 1876, there was organized the last buffalo hunt made by that tribe. It was the custom, when the council of chiefs ordered such a hunt, to set a day for departure from the home village, but it often happened that there were some laggard families who were not ready on time. Various details of preparation for the trip, the provision of clothing and equipment, the safe caching of the goods left at home, and such matters would always be still unfinished by some families when the day arrived which had been publicly set for departure. In such cases the expedition officially set out on the journey, but was obliged to

wait at camping stations on the first part of the route until the laggards finally were under way and caught up with the procession and came into camp.

In this itinerary I shall identify locations by the names of counties, towns and villages which did not exist at the time the hunt was made, but which have been created in the process of white occupation which has taken place since that time. The line of march and the camp sites are indicated upon the map (Map 2).

On this occasion, at the start of this buffalo hunt, which turned out to be the last, there were some persons who were still unready. The main body, however, started on the day appointed. On this first day they marched only a short distance and made camp about six miles from the villages at a suitable place on a little stream, which is now denominated on our maps as the north branch of Blackbird Creek. This place was chosen because it met the necessary requirements of wood for fuel, good water for cooking and for their horses and dogs to drink, and plenty of good grass for pasturage. The main party waited here two days until the stragglers came up with them, and next day struck camp and moved on to a camping place on the west side of the stream which is now called Logan Creek, and about two or three miles northwest of Bancroft in the northeastern part of Cuming County, Nebraska. They reached this place about four o'clock in the afternoon. Early next morning they moved on again to a camping place about seven miles north of West Point, Cuming County, Nebraska, on a creek now named Plum Creek on our maps. Next day they reached the fourth camp at a place on the east side of the Elkhorn River a little below Wisner. The next evening they made the fifth camp on a small stream which is called Rock Creek on our maps, but which the Omahas called by a name which in their language means "calamus" or "sweet flag." The sixth camp was on a small stream at a place about six miles northeast of the present town of Clarkson. The seventh camp was on a stream at a place about six miles south of Clarkson.

The eighth camp was near the mouth of a creek now called Lasker Creek, which flows into Shell Creek near the east boundary

MAP 2. Itinerary of the last buffalo hunt of the Omaha tribe, December, 1876

of Platte County. From this place they marched southwest, passing Columbus, and made the ninth camp on the Loup River near its confluence with the Platte River. Next morning they broke camp and crossed the Platte River just above the mouth of the Loup River; then they marched up the Platte River on the south side, making their tenth camp near the river and about opposite the mouth of Prairie Creek, which flows into the Platte River from the north side, near Gardiner. The eleventh camp was made near the river on the south side, about opposite the present town of Clarks; the twelfth camp, near the river just opposite Central City; the thirteenth, on the south side of the river opposite Grand Island, near the line between Hall and Hamilton counties.

When they broke camp here the next morning they carried wood and water with them for the fourteenth camp, for now they had to cross the plain which lies between the Platte River and the Republican, and it was a journey of two days from the Platte River up over the treeless and waterless plain before they could reach the streams flowing into the Republican River to the south. The fourteenth camp was made on the open prairie about six miles north of the city of Hastings.

The next day's march, passing Juniata, brought them to the fifteenth camp at a place somewhat to the northwest of Roseland on a small stream which flows southeastward into the Little Blue River. They marched on south and made their sixteenth camp near Bladen on the Little Blue River. They reached the Republican River and made their seventeenth camp somewhere near Riverton. Next day they marched westward up the valley of the Republican River and made their eighteenth camp somewhere between Franklin and Bloomington.

The scouts had not yet found trace of the herds, and next day the hunting party turned south into Kansas and made the nineteenth camp on a little stream in the east part of Phillips County, Kansas, about six miles north of Agra.

Previous to the middle of the nineteenth century the buffalo hunting grounds of the Omaha were in their own country in the northeast quarter of Nebraska and in the Sand Hills and also

the Loup River valleys in the Pawnee country. A little after the middle of the nineteenth century, on account of advancing white settlement, it was necessary to go farther west and south into the valley of the Republican River in the Pawnee country; and then in the early part of the seventh decade of the nineteenth century it became necessary to go a still greater distance to the southwest, to the limits of what had been the Pawnee country, but now long since ceded under coercive persuasion to the United States. This was across the valley of the Republican River, or even beyond into those of the Solomon River and the Smoky Hill River. The Omaha had been on the march for three weeks; they had successively passed the valleys of the Logan, the Elkhorn, the Loup, the Platte and the Republican in Nebraska, and had now come into the valley of the Solomon in Kansas, and yet no encouraging signs of any herds had been seen. They made the twentieth camp near the mouth of a creek, now called Plum Creek, which flows into the Solomon River from the north.

Next morning they crossed the Solomon River and went on to the South Fork of this stream, making their twenty-first camp near Woodston. From this place they moved up the river next day to the twenty-second camp, a mile or two west of Stockton. The twenty-third camp was near the head of a little stream now called Lost Creek on our maps; the twenty-fourth, on the Saline River near the mouth of a creek flowing in from the north near the northeast corner of Trego County and the southeast corner of Graham County; the twenty-fifth, about twelve miles farther up the Saline River near the north line of Trego County; the twenty-sixth, on the north side of the Saline River about six miles northeast of Buffalo Park. Here they crossed the Saline River and the twenty-seventh camp was not very far south of Buffalo Park. The twenty-eighth camp was on Hackberry Creek, near Gove; the twenty-ninth, on what is now known on our maps as Plum Creek, at a place about ten miles southwest of Gove; the thirtieth, on the north side of the Smoky Hill River near the site of Tweed. From this place they moved farther up the river and made the thirty-first camp near the present boundary line between Gove and Logan counties. They had not yet found signs

of herds and the next day they crossed the river, moved on south and made the thirty-second camp on a small creek flowing into the Smoky Hill River from the south in the southwest part of Gove County.

It was the latter part of December when at last three of the scouts sent out ahead from this thirty-first camp brought in their report to the director of the hunt that they had found a herd. When they set out very early that morning they had their instructions as to the location of the camp for the next night, so that when they had scouted far ahead and found the herd they made all haste to that place. It was about nine o'clock at night when the scouts arrived in camp. They reported immediately to the proper officer that they had found a herd on the south side of a place marked on our present maps as White Woman Creek, which is in the southwest part of Wichita County, Kansas. After making their report they were discharged from duty. They went at once to their own families and were given their supper and then lay down to rest. And rest was very much needed by them, for they had trotted a distance of about one hundred miles that day, as may be seen by consulting the map and noting the distance from the thirty-first camp on the Smoky Hill River to the place about eight or ten miles from the southwest corner of Wichita County, where the herd was found, and then back to the location of the thirty-second camp. There had recently been a fall of snow, and this had melted and flowed into the streams, so that the channel of every intermittent stream was now bank full. At one place they had to wade through shallow water and ice for about four hundred yards. After crossing the stream they sat down, removed their wet moccasins and put on dry ones, and then trotted on again. One of these three young scouts was Francis La Flesche, for many years a member of the staff of the Bureau of American Ethnology at Washington. Another one was Mr. Amos Walker, now deceased.

Next morning the herald wakened the camp very early. The order of the day was announced, and all haste was made by forced march to reach the place of the thirty-third camp, which was near the great bend of Ladder Creek, about six or eight miles

north of the town of Scott, in Scott County. After an early rising on the following day another forced march was made to White Woman Creek, where the last camp, the thirty-fourth, was made, about six miles south of the place where the town of Coronado now is, in Wichita County.

The camp was again wakened early, for a very busy day was ahead. Since the wind was in the south, the officers deployed the hunters by the north and west of the herd in taking their stations surrounding it, so that those who were to be posted to windward were the last to take their stations. Thus any movement of the herd when alarmed by the slayers would bring it nearer to the camp for the slaughter and hence decrease the distance which the meat and other products had to be carried. It was already growing late in the short December day before they were able to close in upon the herd, and it was pitch dark by the time the butchers were through with cutting up the carcasses, and they even lost some of the meat by reason of the darkness. No doubt this meat was all devoured by the wolves and coyotes before daylight.

The people remained at this final camp after the slaughter only so long as was needful to take care of the meat and hides and other products. They were no longer under the restrictions of the police regulations which governed the hunt from the day they had left the village until the herd had been discovered and the killing had been made. The director of the hunt also was now freed from the care and heavy responsibilities of his office. He was once more a private individual.

Gradually the great camp dissolved and broke up into several bands according to consanguinity and affinity. As rapidly as they finished the work they had to do at the slaughter ground these bands scattered and went their various ways, traveling and camping, stopping for a while at places here and there along the various streams, trapping and hunting small game. The various bands now worked back toward their homes in northeast Nebraska. They were not hurried on the return trip, but they had to be home in time for preparations for the planting of their crops in the spring, and until that time they found it better to live out

here in the hunting country. The scattered bands worked eastward through northern Kansas, following the courses of the streams, not only adding to their store of goods by the industry of the chase, but remaining during the winter in the latitude of northern Kansas, three and one-half degrees farther south than their own country in northern Nebraska, and so avoiding the more rigorous weather they would have encountered if they had gone home at once. Thus they spent the months of January and February and worked back into Nebraska, mindful to reach home before the spring break-up of the ice in the rivers should make the crossings more difficult and dangerous, or even impossible.

The winter of 1876 saw the last Omaha tribal buffalo hunt, the last in a long series of such tribal expeditions of semiannual occurrence, summer and winter, during the centuries since the Omaha had made their advent into the prairie country and had learned from the Pawnee and Arikara how to make their living by taking the buffalo and by cultivating corn and beans. Never again did a party of Omahas look upon a herd of buffalo; there were none to be seen. From this time forward the Omaha must once more be learners of a new way of living, and their teachers were to be of a race less sympathetic, friendly and helpful than their Pawnee and Arikara teachers had been three or four hundred years before.

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THE SACRED BUNDLES OF THE ARIKARA

MELVIN R. GILMORE

THE Arikara nation is the northernmost of a racial group which we call the Caddoan, from the name of one of the southern tribes of this stock, the Caddo, whose country was in what is now called Louisiana. Other nations of this stock were the Waco, Wichita and Pawnee. The several nations of the Caddoan stock have moved out through many centuries in successive waves from the southwest, perhaps from within Mexico. The Arikara, who appear to have been the pioneers in this movement, have advanced farthest from the southwest area of origin, successively occupying for considerable periods of time one area and then another all the way from the Rio Grande in the south to the Missouri in the north. As they moved on farther north they were followed by their relatives, the Pawnee, and these in turn by the Wichita, until at the advent of the Europeans the Arikara were on the upper Missouri where it is joined by the Grand River flowing in from the west; the Pawnee were on the Niobrara, the Platte and the Republican rivers; and the Wichita were on the Arkansas River. Five centuries earlier the Arikara had dwelt for a long time in the area bounded on the east by the Missouri River, on the south by the Platte and on the north by the Niobrara. We have no definite knowledge at present as to the western limit of their territory at that time.

The religio-civic organization and customs of the Arikara and Pawnee were similar, and both nations were agricultural from time immemorial.

Both the Arikara and the Pawnee populations have been sadly diminished in recent historic times by contagious diseases new to them, and from other hardships and disasters which also resulted from European contact. From the evidence we have it appears that in the time of their strength the Arikara nation had

a population numbering several thousands of persons. The nation at that time was organized in twelve villages, with each village occupying a certain geographic position with relation to all the others. In all the centuries of their gradual migration northward to the upper Missouri these twelve villages maintained approximately the same relative positions in each area successively occupied.

Each village had its own local government in all home affairs, but the several villages were also organized for united deliberation and coöperative action upon matters of more general concern. To this end the twelve villages were disposed into four divisions of three each, one of which was designated as the head of its group. The village chiefs governed in local affairs, and the chief of the head village had, in addition, authority in matters affecting the three communities within that group. There was a principal chief of the nation, supported by a board of four associate chiefs, one from each of the divisions. This board was charged with the governmental affairs of the nation.

In all religious ceremonies of the Arikara, whether private or public in their nature, certain sacredly symbolic objects were used which served to fix the attention of those taking part upon the subject with which the ceremony was concerned, and with the particular teachings of the Sacred Legend bearing upon the matter. The Sacred Legend is the body of doctrine upon wisdom and morality which has come down through the generations from the venerable wise men of ancient times. It might be called the unwritten Bible of the Arikara.

The sacred objects were displayed to view during the ceremonies, but at other times were incased in wrappings which protected them from injury and also veiled them from the vulgar gaze of the curious. Such Sacred Bundles, or collections of sacred objects, were of several classes according to their nature and purpose. Thus in their functions some were of personal significance and use, some had to do with household and home affairs, others with the functions of the Mystic Societies. As has been told in another relation,[1] there were eight of these Mystic Societies which

[1] Pages 69–70 of "The Arikara Tribal Temple," *Pap. Mich. Acad. Sci., Arts and Letters*, 14 : 47–70.

had their regular stations in the sittings of the great public ceremonies, such as those of Mother Corn and the Holy Cedar Tree. These Sacred Bundles were in the care and keeping of the officers of the societies.

Then there were the great Sacred Bundles belonging to the several villages. Each of the twelve villages of the Arikara nation had its own Sacred Bundle, which was in effect the palladium of the village. The specific contents of these twelve bundles differed somewhat, and the ritual of each differed in detail from that of every other, but their general purport was similar. These twelve great Sacred Bundles were in keeping of custodians, or priests, whose duty it was to guard the safety of these venerable objects, to perfect themselves in the rituals pertaining to them, to teach these rituals to those who were to become their successors, and to take the lead in the celebration of the religious festivals. The priesthood, or custodianship, of the Sacred Bundles was hereditary in certain families, always with the provision that the candidates should demonstrate fitness and ability for the vocation.

When religious ceremonies were to be celebrated the keeper of the Sacred Bundle brought it into the sacred lodge or temple. There it was opened upon the altar so that the holy objects contained in it were exposed to the reverent view of those who assisted by their presence and participation in the ceremonies of the festival. When a Sacred Bundle was opened on any occasion the people brought offerings and gifts which they deposited before the altar. Out of these voluntary gifts the keeper retained a part as fees for his services, a part he gave as fees to his assistants and the rest he distributed to the poor, the aged, the orphans and the sick and needy of the village.

The teachings of the unwritten Bible of the Arikara, which are called to mind by the objects in their proper order in the Sacred Bundles, give an account of the origin and development and mutual interdependence of all living creatures, both plant and animal, and of man's place in that living world as a partner and companion with all other living things on earth. They inculcate the idea of gratitude due from man to vegetation and

all species of animal life which have given their companionship and their good gifts for man's enjoyment. They teach also religious joys and duties, ethics and moral conduct, justice, mercy, self-control, habits of industry, hospitality to strangers, patience and forbearance toward fellow-men, compassion for the unfortunate, consideration for the aged, encouragement and persuasion of youth toward right courses in life directed to usefulness and honor, tenderness toward children and the duty of parents to teach and train their children and "to set their young feet in the right path."

Every one of the village Sacred Bundles has among its hallowed objects an ancient sacred pipe and a parcel of Arikara tobacco, and a mussel shell for use as a dish to contain the tobacco, four perfect ears of sacred corn and an ancient hoe, the blade of which is made from the shoulder blade of a buffalo and the handle of box-elder wood. On the outside of each of these Sacred Bundles there is a bar of wood to which are attached five ancient rattles made from the shells of bottle gourds. These five rattles are used by the chief priest and his four assistants to beat time for the singing of the hymns and chants in the celebration of religious ceremonies. The bundles also contain the skins of certain species of birds and small mammals and fishes. Each of these objects serves to call to mind some particular item in the volume of teaching pertaining to the bundle.

The presence of a Sacred Bundle inspired in the people feelings of awe and reverence, but at the same time also feelings of joy and confidence, of hope and well-being, and sentiments of good will. On one occasion when a Sacred Bundle lay open before us upon the altar the priest said, in bringing our minds to a proper attitude of contemplation:

> We are here in the presence of a Sacred Bundle. All Sacred Bundles give blessings to those who are privileged to see them, if such persons be in the right attitude of mind. It is your good fortune to be here today and to see this bundle opened, and you must be in the right frame of mind, which is fitting in the presence of this holy thing. It was our ancestors who placed all these things in this bundle as they were directed. It was not a thing of their own device, but they obeyed divine instruction in the making of it. Upon the man to whom it has been given to know the ritual there rests a

heavy burden. He has undertaken a great responsibility. He must take care to live a blameless life, giving no cause of offense to anyone. He must be temperate and mild in his speech, never uttering harsh words even under great provocation. Every day he must do right in all things, and be always kind and hospitable. He must be gentle and forgiving and cherish no ill-will against anyone even though one may have done him injury.

The chief priest and his four associates were in a manner symbolic of the being of Neshanu Natchitak, the Chief Above, and his four Aides. These Aides of Neshanu Natchitak are the spirits of the four quarters of the earth; namely, the Southeast, sacred to the Sunrise with its vivifying power and to Vegetation with its good gifts; the Southwest, sacred to Thunder, the giver of the water of life, and to the Animals, chief of which was the Buffalo; the Northwest, sacred to Wind, or the breath of life, and to Birds and other forms of life of the air; the Northeast, sacred to Night, the restorer, and to Mother Corn, mediator between man and the Chief Above, the dispenser of his good gifts to man.

The inclusion of ears of corn and of the hoe, an implement for cultivating corn, in all the Sacred Bundles is evidence of the all-important place which agriculture held, and for ages had held, in the life and thought of the Arikara people. Rituals of all phases of Arikara life, public and tribal, private and personal, are replete with references to the divine gift of corn.

As an example of the character of the Sacred Bundles of the villages and of their contents, I shall describe one which I had opportunity to examine on August 12, 1930. This bundle is no longer in use for ceremonies for the reason that no one now living is proficient in the ritual which pertained to it, for the last priest who knew its ritual died years ago. But the venerable shrine is still held in reverence and kept with solemn care. Because the lashings upon this bundle were so old and had begun to show signs of dilapidation, it was feared that it might fall to ruin. The present custodian decided to have it opened and retied with new lashings. Of course this act must be done with all due ceremony. A woman who was adept in the old-time craft of dressing skins had been employed to prepare a hide and cut from it a suitable

thong for tying. The present custodian, not being proficient in the ritual of any of the Sacred Bundles, had engaged to perform the ceremony of opening and retying this now defunct bundle a man well versed in the ritual of another bundle which is still used in public ceremonies, so that so far as possible this silent presence from the past should be treated with all the respect and ceremony due to it.

The custodian invited me to be one of the company required to be present for the proper observance of the ceremony. This invitation gave me an unusual opportunity to examine the contents of the bundle, especially as I was allowed freely to handle the objects, and the advantage was still further enhanced by the permission quite willingly given me to bring in an ornithologist, Mr. Russell Reid, to identify the species of birds whose skins were among the objects contained in the bundle, and to make photographs for record. Every possible facility was given me, and the most cheerful patience was shown for the delay and inconvenience made necessary by our study of the objects and their placement for photographing.

In preparation for the ceremony the fire-chief kindled a fire in the fireplace of the Holy Lodge, a buffalo skull was placed in its proper station by the southwest main post of the lodge, and the bundle was brought and laid upon a pallet prepared for it in the holy place before the altar. A new rawhide thong, which had been prepared to replace the old thong weakened by age and decay, was brought forward for the new binding.

Since the Holy Lodge had been floored with boards to meet modern requirements for other purposes besides those of the old-time ceremonies, a circular earthen fireplace had been built of puddled clay in the center of the floor, and a vessel containing earth was prepared as a small fireplace on which to burn the sweet grass incense before the altar. The fire-chief now brought live coals from the fireplace and laid them on the earth contained in this vessel. Then from the wisp of dried sweet grass belonging to the Sacred Bundle a little was broken off and sprinkled on the coals. As the smoke arose the priest lifted the Sacred Bundle from its bed, held it just above the bed of coals and allowed the

smoke of the incense to rise and touch it on all sides. When he had done so he replaced the bundle in its resting place before the altar and himself returned and sat down at the back of the altar and made an address upon the character and significance of the great Sacred Bundles of the Arikara people, and of this one in particular, left as it was, silent and desolate by the death years ago of the last of its priests. He disclaimed any authority to speak for this bundle, but said that, since no one now living had the proper knowledge of the ceremonial pertaining to it, he, because he was acquainted with the ritual relating to a similar Sacred Bundle, had been asked and had consented to perform this ceremony to the best of his ability. Then he spoke of the purpose of our action in the renewing and retying the bundle in order that it might rest in greater security and receive the respect which it deserved, and that we might hold in honored and grateful memory those whose lives and thoughts and dreams in the distant, vanished past were bound up in it.

While he was speaking the bundle lay on its resting place before the altar in its ancient wrapping of buffalo hide tied with a thong which had become frayed with age, and all colored a soft brown by countless incensings with the smoke of sweet grass. Attached to its upper side was a bar of wood to which were fastened the five ancient gourd shell rattles, their handles toward the altar, their bodies resting forward over the bar. When he had finished speaking he called the fire-chief to assist him. The ancient lashing was untied and the wrapping turned back, exposing the contents to our view. The objects were all lifted reverently and laid out in order, and we handled and examined them with care and close attention. We identified and listed the objects and photographed them. See Plate III.

The bundle as wrapped and tied formed an oblong pack about two cubits in length, one cubit in width, and about half a cubit in thickness. The thong which bound the bundle was passed twice around it lengthwise and twice crosswise, making four crosses of the thong on the upper side and four on the lower. Attached on the outside were the five gourd rattles before mentioned, four wildcat skulls discolored a dark brown by age and smoke, a sheaf

of slender sticks of sandbar willow (*Salix longifolia*), whose use is explained in a former paper,[2] and some braids of dried sweet grass to serve as incense.

Within the bundle we found a number of skins of birds and some other objects as follows: one Swainson's hawk, one long-eared owl, one small northern loon, one duck hawk, one Carolina paroquet, one Cooper's hawk (?), one western grebe and four burrowing owls wrapped in a fawn skin. Other objects were one small eagle feather and one downy plume, two large fresh-water mussel shells to serve as dishes for holding the sacred tobacco used in making smoke offerings, several ears of very old yellow flint corn, one large gar pike skin, one meat hook made of a long slender bird claw attached to a wooden handle, four partly burned shafts of enemy arrows from battlefields, two curious flat objects of wood, shaped somewhat like the short Roman sword, two sacred pipes of catlinite carved in a curious archaic form, the stems of which were made of the same species of wood as the sword-shaped objects mentioned above. This is a species which does not grow in the country now occupied by the Arikara, but farther to the south, where they formerly lived. For this reason the species is not yet identified. The Arikara name of the tree is *nakis-atina*, which literally means "mother-wood." The enemy arrow shafts have been partly burned from serving as lighting sticks for the sacred pipes in making the ceremonial smoke offerings.

After we had examined and listed and photographed the objects in the bundle, the fire-chief filled and lighted the pipe and handed it to the priest to make the ceremonial smoke offerings. Then he passed around, extending the mouthpiece of the pipe to each person participating in this ceremony, so that all might be put in communion of spirit in contemplation of these sacred objects and in spiritual unity with all those persons connected therewith, from ancient times to the present, and that we might all bless ourselves from the sacred pipe. This is done by lightly laying both hands about the stem of the pipe at the moment the mouthpiece is presented to the lips and drawing the hands along

[2] "The Arikara Book of Genesis," *Pap. Mich. Acad. Sci., Arts and Letters*, 12 (1929): 95–120.

the length of the pipestem toward one's person and then making a gesture of passing the right hand along one's left arm from hand to shoulder, then the left hand along the right arm to the shoulder, then both hands over the head and down the shoulders. The whole gesture is done as quickly and easily as the Christian gesture of making the sign of the cross. When he had brought the pipe to everyone in the company the priest ceremonially emptied the ashes from it and returned it to the fire-chief, who placed it again in its resting place.

The supplies of food had already been brought in and set in their accustomed place ready to be served by the waiters. Now the herald went outside and extended to the people an invitation to come in to the feast. A community meal or feast is always a part of any ceremony.

When the people bidden to the feast had come in and seated themselves in their places, a representative of the Duck Society, one of the eight Mystic Societies of the Arikara nation, came forward to make smoke offerings on behalf of his association. A representative of the Buffalo Society did likewise for his organization. After the pipes were finished they were emptied and returned ceremonially to the fire-chief.

Then the priest of the ceremony made an address to the assembled people, explaining to them the occasion of the ceremonial gathering. At any time when a Sacred Bundle is opened it is proper for any who desire to do so to make gifts and offerings, and for names and honors to be conferred publicly and formally. Now the woman who had made this ceremony and feast for the purpose of having the bundle opened and renewed and retied, announced that she desired to have a name conferred upon her young daughter-in-law on this memorable and auspicious occasion. Then she made the usual gifts and the young woman was called forward and the priest formally conferred upon her the name which had been chosen for her, and he made public proclamation of the fact to all the people, and to the Sun, the Waters, the Wind and the Night; to Vegetation, to the Buffalo and other animals, to the Creatures of the Air and to Mother Corn, saying that this young woman should henceforth be known

by the name which he pronounced, a name which has been well loved by the Arikara people ever since ancient times and which means in English "Mother-comes"; it is an allusion to Mother Corn.

Then I heard myself called up by my tribal name. I rose and went forward, and a gorgeous gift in the form of a very splendid eagle-feather war bonnet, which was placed upon my head, was presented to me as an honorable decoration, whereupon a eulogium was pronounced upon me, praising and commending me for past services to the tribe, for continual interest and helpfulness to the people.

The sacred relic pipe was taken up and filled and lighted to make the smoke offerings and to bless the people. The offerings were made and the pipe was carried around in regular order to all the people in the lodge, first along the south half of the circle from the doorway to the altar, then along the north side. After all the people had had the opportunity to touch the pipe to receive a blessing from it this venerable object was ceremonially emptied and returned to its rest upon two billets of wood before the Sacred Bundle. Thereupon the priest blessed the food which had been provided for the feast, making an offering of a small bit of it to each of the four quarters, to the objects of the bundle, to the venerable relic pipe which pertained to the bundle, and finally to the pipes at the tobacco cutting board by the fire-chief's station.

When all this had been done the people were told to set out their cups and bowls. The waiters then passed around with the food and drink and served the people. After all the people had been served the signal was unobtrusively given and they began to eat. When all had been satisfied a signal was given and the people rose and went out. Then the ancient hide covering of the Sacred Bundle was freshly spread, the objects were all replaced in their former proper order, a new supply of Arikara tobacco and of dried sweet grass was added, the cover was folded over, the new thong was lashed about the bundle in place of the old deteriorated one, and the ceremony was over. I did not see what disposition was made of the old thong which had served its time,

but the probability is that it was reverently carried away to some lonely hilltop and there left to the elements. Such disposition would be consistent with sentiment and custom regarding venerable outworn objects.

I shall describe another Sacred Bundle which I have seen opened in ceremonies, that of the village called Hukáwirat. The outside wrapping is buffalo skin cured with the hair on. In wrapping the bundle the hair is on the inside. The bundle is of about the same dimensions as the one already described, and is likewise bound around with buffalo-hide thong twice lengthwise and twice crosswise, thus making four crossings on the upper side and four on the lower side of the bundle.

Bound lengthwise on the upper side of the bundle is a stick or bar of the species of wood which the Arikara call *nakis-atina*. To this bar of mother-wood are tied at equal intervals five large gourd rattles, one for the priest and one for each of his assistants in marking the cadence of the ritualistic singing. There is also attached to the outside of the cover a sheaf of thirty-four slender sticks of peeled sandbar willow (*Salix longifolia*), one span in length. The use of these sticks is described in another paper.[3]

When this Sacred Bundle is opened it is required that the sweet grass and tobacco in it shall be renewed by a fresh supply of three dried braids of sweet grass (*Hierochloe odorata*) and one whole plant of Arikara tobacco (*Nicotiana quadrivalvis*).

In this Sacred Bundle there was a pipe of greater than ordinary size; the bowl was made from catlinite and the stem of ashwood. The stem was about a cubit in length. At about the width of a hand from the upper end of the pipestem was fastened a split quill, and tied to this were a piece of a scalp, a small bit of a red woollen blanket, and a small polished shell somewhat like a snail shell. In the carving of the pipe bowl was a perforation through which was passed a thong tied to the pipestem. On this thong was strung a copper or brass bead and two Hudson Bay trade beads of glass. The pipe was wrapped in the cardiac sac of a buffalo.

There was also a meat hook made from a hawk claw with a

[3] See note 2.

handle of mother-wood. It was used for lifting meat from the pot in serving the feasts.

Other objects in the Sacred Bundle were: four perfect ears of eight-rowed white flint corn; a sparrow-hawk skin with small shell beads for eyes; four white feathers, probably of the snow goose; a skin of a species of hawk (unidentified). Its name in the Arikara language is *nikritáwikrisu*. Two small pouches of tobacco were tied to this skin.

Still other objects were: another hawk skin (species unidentified), with a pouch of tobacco attached; one valve of a fresh-water mussel shell to serve as a dish for tobacco to be used in smoking ceremonies; an enemy scalp fastened to a piece of hoof tied on the end of a braided buffalo-hair rope about eight feet long, which also had fastened to it a round piece of elk skin. The scalp was taken from a Kiowa in battle about the year 1830. The broken piece of a gunlock was also attached.

Another hawk skin of a larger species (also unidentified) was included; also the skin of a small species of owl. The latter was wrapped with a cord twined from fibres of Indian hemp (*Apocynum cannabinum*). A twig of mother-wood was wrapped with the skin because this owl is a forest dweller. A man who was going out as leader of a war party might make petition to the keeper of the Sacred Bundle and be permitted to take this object with him, tied to his hair, as an invocation to the guardian spirit of this species of owl for aid in the success of his expedition.

We found also the skin of a gar pike; a small mammal skin, apparently that of a raccoon; and the skin of another species of small owl which lives in the woods. With this skin was also wrapped a small piece of mother-wood, with cord made from fibers of *Apocynum cannabinum*.

The skin of a small burrowing mammal, the Arikara name of which is *sulícit*, was included. It was stuffed with buffalo hair.

There was also the skin of a prairie or burrowing owl. Although this species dwells on the prairie in the abandoned burrow of any small mammal, such as the prairie-dog or the badger, it is the Arikara belief that its remote ancestors dwelt in the woods, and that by evolutionary process its habits have changed. Be-

cause of the belief that this owl also was once a forest dweller, as the other owls are today, this skin is wrapped, like the others, with a piece of mother-wood, and bound with cord made from *Apocynum cannabinum*. The twine used in wrapping was dyed red.

The skin of a bird which appears to resemble a kingfisher, but is larger, was included.

There was one valve of a fresh-water mussel, to be used as a dish to contain the medicine for the ritual of "Comforting the Mourners," described in another paper entitled "The Arikara Consolation Ceremony." [4]

Two more hawk skins were found, both apparently of Swainson's hawk, one having attached to it a small pouch containing the immature seed capsules and inflorescence of Arikara tobacco used for ceremonial smoking.

Two of the bird skins were in wrappings of fawn skins, two in antelope skins, and one in a big-horn skin.

Last of all was a small parcel wrapped in calico, to represent in recapitulation the entire Sacred Bundle. This packet contained a perfect ear of white flint corn closely incased in a cardiac sac drawn over it while fresh, so that as it dried it shrank closely about the ear, and since it is very thin and clear, the ear of corn may be seen through it as through a sheet of celluloid. Besides the ear of corn there were a feather of each species of bird whose skin was in the complete bundle, a small piece of Apocynum fiber cord, a twig of mother-wood, and a whistle made from the wing bone of an eagle, to which was attached a bit of eagle-down feather and a small pouch containing a pulverized vegetable product of a species the name of which could not be ascertained. There were also a second pouch of this powder and another ear of corn wrapped in a cardiac sac. The purpose of this miniature bundle was for use in an emergency when it was impracticable to open the complete Sacred Bundle, as during close pursuit by an enemy force. In such a case the miniature bundle was opened, the bone whistle was sounded, and some of the powder was blown into the air in the direction of the enemy. It was believed that

[4] *Indian Notes*, 2 (1926) : 256–274, Museum of the American Indian, Heye Foundation, New York.

this would effect the confusion of the enemy, that a mist would fall, and that the enemy would not be able to follow and find the people.

I was also invited at another time to assist in the ceremony of opening and renewing another of the great Sacred Bundles of the Arikara, a bundle whose ritual had perished by the death of the last man who was versed in it.

The wrapping was the whole skin of a young black bear. It had been cured with the hair on. The bundle was wrapped with the hair side out. It is said that black bears were tamed and kept as pets in the Arikara villages in former times. There are now but four of the original five gourd rattles belonging to this bundle. Many years ago one of the five was broken accidentally. The fragments were therefore carried out to a solitary place on the top of a high hill, smoke offerings were made, and they were left to the elements.

This bundle was found to contain the following objects: a large catlinite pipe, wrapped in the skin of a buffalo foetus, in general type similar to the one described above, but having carvings peculiar to itself on the stem, which was of mother-wood; an object made of mother-wood, shaped much like a Roman short sword, broad and flat, but with scalloped edges; four ears of yellow flint corn; the skin of a sparrow hawk; the skin of a species of large owl; the skin of a little prairie burrowing owl; the head and neck of a snow goose; a gar pike skin; three scalps taken in battle, one from a Dakota, having attached to it the skin of a goldfinch, a bird of symbolic significance to the Dakota; one valve of a fresh-water mussel shell to be used as a container of the ceremonial tobacco for making the smoke offerings; the skin of a grebe; two of the enemies' arrow shafts, which had been picked up on the field after the battle, to be used as pipe-lighters in the ceremonial smoke offerings; two wildcat skulls wrapped in a piece of Scottish plaid goods, of the old Hudson Bay trade.

Sacred Bundles of another class are those of the Mystic Societies of the Arikara tribe. Of these societies it is said there were originally four, namely, the Ghost, the Buffalo, the Owl and the Bear. Later four more societies were instituted, namely, the Deer,

the Cormorant, the Duck and the Sioux. But these latter were considered of minor importance as compared with the first four.

I have examined the contents of one such bundle which belonged to an officer of the Owl Society. He is now deceased and the bundle has been acquired from his widow for the Museum of Anthropology of the University of Michigan. See Plate IV.

Among the objects in this Owl Society bundle was the skin of an owl filled out over a stuffing of dried Indian hemp (*Apocynum cannabinum*). Its wings were folded down in natural attitude against the sides. In the eye holes of the skin had been set pieces of cunningly cut and fitted disks of buffalo horn, with polished convex surfaces to simulate the bird's eyes. The finished object forms a fair effigy of the living bird. This effigy was fixed upon the lodge wall above the station of the Owl Society at all times during their sessions in the Sacred Lodge. In symbolic significance it represented Night. His eyes symbolized the Morning Star (Hopírikusu). His plumage betokened all kinds of woody vegetation, all the species of trees and bushes of the woods, wild fruit trees and vines.

There was a pair of bracelets made from the soft-feathered skin of an owl's legs, with the feet and talons left on and hanging as pendants from the bracelets. They were worn by members of the society as part of their regalia in all ceremonies and performances.

In addition there was an owl plume which was worn attached to the hair of the head by members of the society in all their meetings, and also when a member in his function as a physician was treating a patient. It was considered to be potent as an aid to drive away the disease.

The head and neck of another owl were included. They were used in sleight-of-hand performances before the lay people by members of the Owl Society in public spectacles on such occasions as the celebration of ceremonies. As an example of the performances it is stated that a member of the Owl Society would start toward the doorway from the Society's station, which is at a position in the north side of the lodge circle in a radial line from the fireplace to the wall back of the northwest main post. When

the member had walked from that station about halfway to the doorway, or a distance of about twenty-five feet, another member, still at the Society's station in the lodge, would cast this head after the first member, who was walking toward the doorway, and the head would alight upon his back and cling there. In another performance by members of the Owl Society on such occasions a man walked around the full circuit of the lodge circle, carrying upon his head a burning red coal of cottonwood as large as a double fist and suffering no harm from it.

A downy eagle plume with sweet grass (*Hierochloe odorata*) wrapped about the quill was also contained in the bundle. This plume, attached to the hair of the head, was worn by members as part of the regalia for all meetings of the society.

There were four pear-shaped hard skin rattles. Their bellies were made by sewing together two pieces of deer skin while still fresh and uncured. The pouch was filled and packed hard with dry sand. It was left thus till the skin was cured, when the stopper was drawn and the sand was poured out. Then five small gravel stones were put inside for sounders when the rattle was shaken to mark the cadence of the singing. These stones were said to represent the four societies, namely, the Ghost, the Buffalo, the Owl and the Bear, and the altar group of the chief priest, together with his four assistants. The altar group was composed of those who had passed membership in all these four main societies, having made themselves thoroughly proficient in the rituals of all of them, one after another.

Besides the gravel stones there were also put into the rattle forty hard seeds of Virginia creeper (*Parthenocissus quinquefolia*). These seeds were said to represent the forty songs of the Owl Society. Then a handle made from mother-wood was fastened securely in place, and three down feathers were attached to the belly of the rattle, one in the center of the top, diametrically opposite to the handle, and one on each side midway between top and bottom. The feathered skin of an owl leg was attached to the handle with the talons pendant.

One more object was contained in this bundle, a buckskin pouch filled with leaves of red cedar (*Juniperus virginiana*). The

aromatic leaves of red cedar were burned as incense in all ceremonies of the Owl Society.

When the woman produced the Owl bundle to impart to me such knowledge as she had concerning it and to transmit the bundle to me for the Museum, she first brought a fire shovel of live coals from the stove and sprinkled leaves of red cedar upon them for incense. She then took up the rattles and incensed them in the smoke, together with the other objects of the bundle.

After the woman had told me all she knew concerning the Owl Society and this bundle and of the several objects in it, she transmitted it to my hands in the ceremonial manner. But she retained in her possession the outer cover, telling me at the same time that I could provide a new one. She did so because it was the old custom that, when a change was thus made with respect to these bundles, the old cover was carried out to some solitary place in the woods and left there to the elements, with a small pouch of tobacco and one of cedar leaves attached, prayers and smoke offerings being made and red cedar leaves burned as incense. Such was the disposition of the bundle of the Owl Society, because owls are creatures of the woods. Like disposition would be made of anything pertaining to the Bear Society, because bears also dwell in the woods. But any objects relating to the Duck Society, if they must be put away, would be consigned to some body of water, because ducks live by the water. And if objects of the Buffalo Society must be relinquished the proper thing would be to carry them far out upon the prairie, and there leave them to nature, after the proper smoke offerings and sacrifice of a bit of tobacco had been made.

There remains another class of Sacred Bundles in the Arikara tribe to be mentioned briefly, a form of household shrine to Mother Corn. I have given elsewhere a short account of such an object.[5] These Mother Corn shrines were not for use in public functions, but were of a private and domestic nature, functioning in household forms of worship and devotion. In the olden times they were commonly to be seen hanging on the walls in Arikara

[5] *Indian Notes*, 2 (1925) : 31–34, Museum of the American Indian, Heye Foundation, New York.

houses much as crucifixes are seen in Christian houses. These shrines were quite simple, commonly containing only a perfect ear of corn clothed in a suitable covering of buffalo skin, with a braid of dried sweet grass to be used for incense. Most commonly the ear of corn so enshrined is white flour corn, but sometimes it was a yellow or a red ear. In all such shrines that I saw the corn was of the flour corn type, white, yellow or red. I have seen none which used flint corn or sweet corn for this purpose.

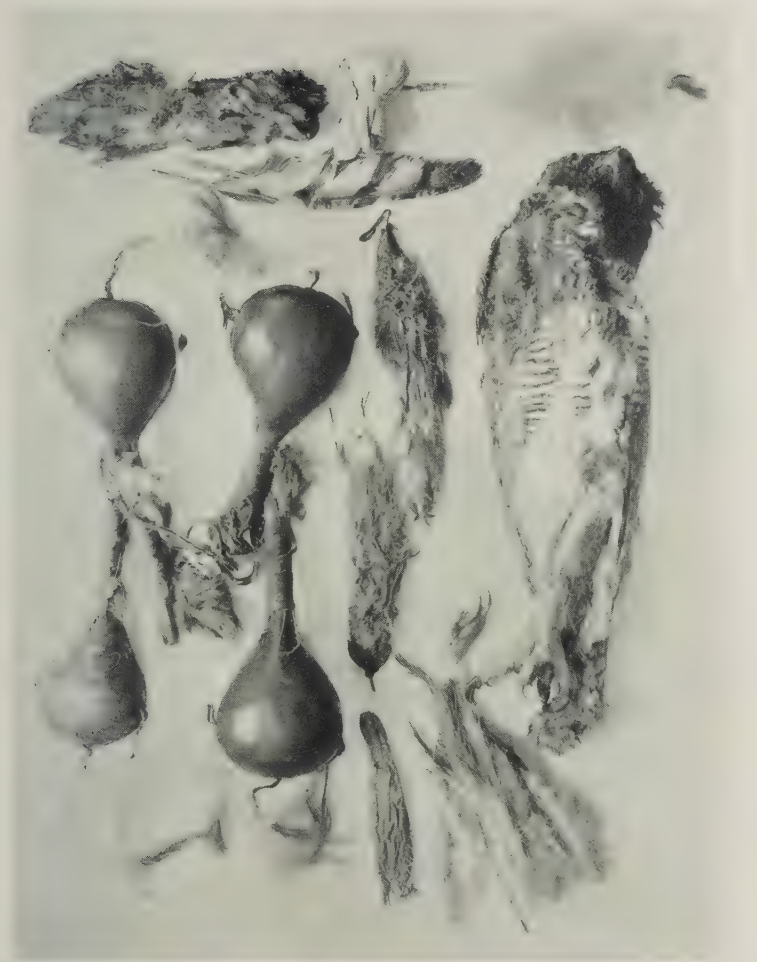
The veneration of Mother Corn by means of this shrine had no set time or season. At any time, according to the desire of the household, gratitude and devotion to corn in recognition of all its benefits and blessings might be given expression by acts of veneration to this shrine. A sacred fire was kindled, a bit of the dried braid of sweet grass was broken off and offered toward all four quarters, toward Mother Earth, and lastly to the Chief Above, and crumbled upon the coals. As the incense ascended the ear of Mother Corn was brought out to view, and both it and its covering were incensed in the smoke of the sweet grass. Members of the household also incensed themselves with the smoke and sought a blessing from the ear of corn, reverently touching it and drawing their hands over it to themselves, placing them upon their heads and passing them down over their bodies. Thus by prayers and honest intentions, by reverently beholding and touching the relic, and by the incense of the sweet grass and the recollection of the beautiful and exalted teachings of the cult of Mother Corn they sought to put themselves in accord and to have her blessing.

University of Michigan

AN ANCIENT ARIKARA SACRED BUNDLE

The bundle is lying near the fireplace in the Sacred Lodge, not its proper station, for photographing. The objects visible here are the five gourd rattles, a fawn skin containing certain bird skins, the ancient pipe in front on two billets of wood, and a mussel shell containing a small pouch of Arikara tobacco. At the left there is a bundle of thirty-four slender sandbar willow sticks for laying the diagram for the genesis story. Near the sticks are two wildcat skulls

PLATE IV



A SACRED BUNDLE OF THE OWL SOCIETY OF THE ARIKARA

At the right an owl effigy; at the left four deer skin rattles; at the top an owl head, a small pouch of red cedar leaves for incense, an eagle down feather and two owl plumes; in the center bracelets made from the skins of owls' legs with talons attached

COLOR IN TALISMAN AND CHARM

HERBERT A. KENYON

MUCH has been written concerning the use of color in folklore by both civilized and primitive peoples. By far the greater part of this material, however, is to be found only in scattered notes in books dealing chiefly with more general folkloristic topics or in articles in journals which are more or less inaccessible. The present paper endeavors to bring together this occasional material, to assemble it systematically, and to show the geographical distribution of similar color usages. Finally, an attempt will be made to show what appears to be the underlying explanation of the talismanic virtues attributed to the colors discussed.

In the talismanic use of color I shall consider articles worn or carried on the person, objects attached to animals or buildings, especially dwellings, marks placed on the body for the purpose of warding off evil, for protection against disease, injury or death, or for the promotion of success or beneficial results to the wearer. Under charms I shall discuss the use of colors for specific purposes, both positive and negative, when accompanied by a written or spoken magic formula and when not so accompanied. Such charms include the causation of disease and death on the part of one's enemies, spells to produce beneficial or curative effects, fortune telling and divination, the magic properties exercised by animals of certain colors, and, lastly, the slightly different but closely related subject of color in omens.

In both talisman and charm one finds only the primary colors red, yellow, blue and green, together with black and white, in anything like general use. Primitive peoples and civilized peoples who have a superstitious turn of mind generally ignore shades and tints. Apparently the color must be a very decided one to exert its good or evil powers. Such gems as lack a strong color charac-

teristic either share the virtues of the chief color relationship or have a special folklore significance attributed to the stone itself. Red and blue are the two colors which predominate to a considerable degree. Yellow occasionally shares the properties of red, but green is comparatively infrequent. Black and white are not so commonly used as red or blue and appear chiefly in incantations, magic or curative charms, and most frequently of all in omens. Other colors appear so rarely in talismanic use in folklore that they may practically be ignored.

Perhaps the most common amulet is that used to avert the baleful effects of the evil eye. But three colors are efficacious in this widespread superstition, red, blue and black, or a mixture of the first two with black. In Scotland a red ribbon is put around the neck of a new-born babe to preserve it from fascination. Sicily and Galicia use a bit of coral.[1] In Portugal the *mano fica* is often of a red composition,[2] and in the British Isles red chalcedony [3] is worn in a ring as an amulet. Throughout Europe and Asia and in many other places one finds red worn as an amulet against the evil eye.

Around the Mediterranean Sea, particularly at the eastern end, blue shares with red the protective power. In the Near East it is the most common talisman. In Jerusalem the "hand of might" is almost always blue and frequently several are worn as a bracelet.[4] In Haifa flat, round, blue disks, painted with a crude representation of an eye, are worn strung together like beads.[5] In Persia a turquoise is stuck into a sheep's eye brought from Mecca from the sacrifice of sheep. This is put into an amulet case and sewn on children's headdresses.[6]

Frequently gems and semiprecious stones are worn more for their effect as a talisman than for their intrinsic value. In Spain,[7] Sicily [8] and Italy [9] coral derives its power from its red color.

[1] Sébillot, Paul, *Le Paganisme contemporain chez les peuples celto-latins*, p. 36.
[2] *Folk-Lore*, 19 (1908) : 215; 24 (1913) : 65.
[3] *Op. cit.*, 19 (1908) : 297.
[4] *Op. cit.*, 15 (1904) : 189.
[5] *Op. cit.*, 13 (1902) : 202.
[6] *Op. cit.*, 12 (1901) : 268.
[7] Machado y Álvarez, Antonio, *Biblioteca de tradiciones populares españolas*, 8 : 258.
[8] Sébillot, P., *ibid.*
[9] Hardwick, C., *Traditions, Superstitions, and Folkore*, p. 255.

White coral practically never appears so used. In northern Africa the carnelian [10] and in India the garnet [11] enjoy the same property, as well as a red string tied around an infant's wrist.[12]

The turquoise, because of its blue color, enjoys favor in the East. In Afghanistan the men wear turquoise rings and the women and children turquoise ornaments, or at least blue beads.[13] Turkish women put turquoise rings on their children [14] and Greek girls in both Turkey and Greece wear blue glass bracelets.[15]

The use of color may be combined with the traditional virtue of some plant. In Russia maidens hang a red ribbon around the trunk of a birch tree and in Germany a radish is worn to avert the evil eye.[16] In both these illustrations the idea is evidently to attract attention away from the individual.

Black, particularly jet, is also frequently found in amulets to preserve one from fascination. It is very likely that the *antipathes* [17] and the *gagates* [18] of Pliny, recommended by the magicians as protective against sorcery, were jet. Especially in Spain jet was used as a preventive against the evil eye. Gutiérrez, a Spanish physician writing in the middle of the seventeenth century, says that infants wore a *fica* of jet at the neck for this purpose.[19] Apparently, the use of jet in amulets attracted the attention of the clergy over a hundred years before Gutiérrez wrote, for in 1525 Charles V issued a pragmatic forbidding the use of jet amulets against the evil eye.[20] Later, images of the Virgin were made of or attached to pieces of jet. The question has been raised whether the veneration of black images of the Virgin in Spain may not be due to this association. Similar

[10] *Folk-Lore*, 18 (1907) : 249. [11] *Op. cit.*, 21 (1910) : 268.

[12] Thiselton-Dyer, T. F., *The Folk-Lore of Plants*, p. 44; *Folk-Lore*, 22 (1911) : 76.

[13] Gray, J. A., *My Residence at the Court of the Amir*, p. 110.

[14] *Ibid.*

[15] Garnett, L. M. J., *The Women of Turkey and Their Folk-Lore*, p. 147.

[16] Thiselton-Dyer, T. F., *op. cit.*, p. 70.

[17] Pliny, *Natural History*, 37.145.

[18] *Ibid.*, 36.141–142.

[19] Gutiérrez, J. L., *Opusculum de Fascino* (Lugdunum, 1653), p. 58; *Folk-Lore*, 17 (1906) : 460; 24 (1913) : 66.

[20] Fortnum, C. D. E., in *The Archaeological Journal*, 38 (1881) : 256.

amulets are to be found in the Tyrol, in Austria, in India, in Ceylon and in Wales.[21]

Sometimes these colors are combined. Granada furnishes examples of talismans of mixed red and blue glass in the form of the *mano fica*,[22] and in Madrid, Toledo and Seville one finds the seed of the *mucuna* or *entada* used in strings like beads.[23] This seed is significantly red, with a black border.

In addition to protection against fascination we find both red and blue used as amulets in the production of many results beneficial to the wearer, too numerous to mention here. Perhaps, however, the use of the turquoise as a *gage d'amour* is the most interesting.[24] It is supposed to change color only with a change of heart and approaching illness [25] and to reconcile man and wife.[26] It is because of this symbolism of constancy that Shylock in *The Merchant of Venice* bemoans the loss of his turquoise ring after Jessica elopes.[27] "As true as turquoise" is an expression used by Ben Jonson.[28]

Jet or black also has its favorable power as a talisman under circumstances other than fascination. It drives away serpents [29] and preserves one from poison and all evils.[30] In the Middle Ages it was a test of virginity.[31] Coal also is sometimes carried as an amulet.[32] It is quite evident that this is not because of the material, but because of its similarity in appearance to jet.

Not only are small articles of specific character, such as gems and beads, worn as amulets, but special dress may be assumed by

[21] Hartland, E. S., *Primitive Paternity*, 1 : 33.

[22] Hildburg, W. L., "Notes on Spanish Amulets," *Folk-Lore*, 17 (1906) : 467.

[23] *Ibid.*, p. 464.

[24] Jones, W., *Finger-Ring Lore*, p. 159.

[25] Swan, *Speculum Mundi* (ed. 1665), p. 259; Donne, *Anatomie of the World*, 1 : 342; King, C. W., *The Natural History of Gems or Decorative Stones*, pp. 65–68.

[26] Brand, J., *Observations on the Popular Antiquities of Great Britain*, (ed. H. Ellis) 3 : 281.

[27] Act III, Scene 1.

[28] *Sejanus*, Act I, Scene 1.

[29] Jones, W., *op. cit.*, p. 106.

[30] Pliny, *op. cit.*, 36.142.

[31] Albertus Magnus, De Minerale, Liber II.2.7, "De Gagate"; also cf. "Wills and Inventories from Bury St. Edmunds," in *Camden Society Publications*, p. 239; Middleton, T., *The Changeling*, IV.12; Shirley, J., *The Maid's Revenge*, III.2.

[32] *Folk-Lore* 19 (1908) : 290; 22 (1911) : 3.

an individual because of his belief in its talismanic properties. Sometimes this is seen in the complete garb worn on special occasions or for special purposes; sometimes it is an accessory added to the costume as symbolic.

Every race which has reached any considerable degree of civilization has adopted a special dress for marriage ceremonies. In the East red is nearly always a very necessary part of the dress of either the bride or groom or both, or is employed in connection with articles used in the wedding festivities. In China,[33] Japan,[34] India,[35] Assam,[36] Egypt,[37] Russia[38] and the Balkans[39] this color is always a conspicuous part of the dress of the contracting pair. In the West we see blue as the required talisman, as is shown in the innumerable variants of the well-known English rhyme,

> Something old and something new,
> Something borrowed and something blue.[40]

In nearly all these folk rhymes blue appears as the most approved color. Green and yellow are considered decidedly unpropitious, as is evidenced by the variants of the rhyme,

> Green's forsaken,
> Yellow's forsworn,
> Blue's the colour
> That must be worn.[41]

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[33] Douglas, R. K., *Society in China*, p. 200; *Folk-Lore*, 1 (1890): 484–492; 9 (1898): 125.

[34] Lloyd, Arthur, *Every-Day Japan*, pp. 298–300; *Folk-Lore Record*, 1 (1878): 133; *Folk-Lore*, 9 (1898): 125.

[35] Risley, H. H., *Tribes and Castes of Bengal*, Part III, 1: 243; Crooke, S., *Popular Religion and Folk-Lore of Northern India*, 2: 28; Oman, J. C., *Cults, Customs and Superstitions of India*, p. 126; *Folk-Lore*, 9 (1898): 125; 13 (1902): 242.

[36] Gurdon, P. R. T., *The Khasis*, p. 128.

[37] Warner, C. D., *Mummies and Moslems*, p. 68; *Folk-Lore*, 21 (1910): 281, 293.

[38] *Folk-Lore*, 1 (1890): 439, 447, 473; 9 (1898): 125.

[39] Garnett, L. M. J., *op. cit.*, p. 321.

[40] Northall, G. F., *English Folk Rhymes*, p. 163 ff.

[41] Wright, E. M., *Rustic Speech and Folk-Lore*, p. 272; Skeat, W. W., "The Court of Love," *Chaucerian Pieces*, p. 543; Lean, V. S., *Collectanea*, Part I, 2: 90, 274–276; *Publications of the Folk-Lore Society, County Folk-Lore*, 5 (1908): 146; 6 (1911): 128.

That blue was a color popularly supposed to represent loyalty in other situations than marriage is shown by these lines from Thomas Middleton: "I can hire blue coats for you all by Westminster Clock, and that color will be soonest believed."[42] Blue was the color adopted by Israel,[43] and was frequently worn by captains and rulers in Biblical times.[44] This may be one source of the idea of loyalty or constancy connected with blue.

It is interesting to note that red practically never appears in western marriage ceremonies nor blue in eastern rites. In China, however, the so-called "longevity garment" is made of the deepest blue, with the symbol for longevity embroidered on it.[45]

The color of garments worn in mourning does not come under this heading, although at first glance such might appear to be the case. Mourning colors are not worn as propitiatory or talismanic, but from the folkloristic point of view for a totally different purpose, namely, that of concealing the mourner from the troublesome ghost or spirit of the deceased. The color worn, therefore, assumes something of the form of protective mimicry, such as the staining with leaf mold of the early Briton [46] or the yellow mourning robes of the Egyptians.[47] Later, mourning became a symbol adopted by the bereaved for protection from the living.

The special dress of clergy and soldiers, the dress required of Jews and other sects in several countries at particular periods, and liturgical uses of color have little or no interest for the present study, since they were determined by laws, rules or regulations or by the whims of rulers. They rarely find their source in folklore. Whatever folkloristic explanation has been given them appears generally to have developed or become attached to them much later than the adoption of the color.

Ordinary clothing is often made protective against misfortune

[42] Middleton, T., *A Mad World, My Masters*, Act I, Scene 1; also cf. Tofte, R., *Fruits of Jealousy*, p. 68; Hazlitt, W. C., *Early English Popular Poetry*, 2 : 31.

[43] Numbers, xv.38.

[44] Ezekiel, xxiii.15; Esther, viii.15; Exodus, xxviii.31; xxxix.22.

[45] De Groot, J. J. M., *The Religious System of China*, pp. 60–63.

[46] Baring-Gould, S., *Curiosities of Olden Times*, p. 3.

[47] *Ibid.*, p. 2.

to the wearer by the addition of talismanic colors. A bit of red added to garments in Scotland [48] and China,[49] and as part of the costume of the warrior in India,[50] or blue in England [51] and among the Druses,[52] protects the wearer from all sorts of bodily harm. Red and white girdles in Japan [53] are efficacious during pregnancy and blue, or blue and white, bands are so used in France.[54] Frequently such girdles are embroidered with symbolic figures or mottoes which are themselves talismanic.

Sometimes, in addition to the thread or pattern in red added to the clothing, a bit of wood or berries of the rowan tree [55] are added by the peasants of Europe because of the tradition that this tree is never struck by lightning. Often some private amulet is bound around with red or blue thread or sewn into a bit of red or blue cloth to make the protection doubly sure.

Not only does the clothing offer an opportunity for the wearing and display of propitious colors, but the body itself may be marked with protective colors. Red ochre, red paint and even blood are often used in marriage ceremonies in India.[56] In Morocco sometimes a spot of blue paint is placed behind the bridegroom's ear to neutralize the powers of evil,[57] and I venture to suggest that the fact that red and blue inks only are nearly always used in the tattooing of the myriad designs to be found on sailors the world over may originally have had its talismanic side, though this aspect has disappeared in the course of time. In general, however, the tattoo designs of primitive tribes and the paint de-

[48] Black, G. F., *Publications of the Folk-Lore Society, County Folk-Lore,* 3 (1903): *Examples of Printed Folk-Lore concerning the Orkney and Shetland Islands,* p. 159.

[49] Doolittle, J., *The Social Life of the Chinese,* 2 : 308.

[50] Dames, M. L., *Popular Poetry of the Baloches* (*Publications of the Folk-Lore Society,* 1905), p. 51.

[51] Lean, V. S., *op. cit.,* Part I, 2 : 274.

[52] Inchbold, A. C., *Under the Syrian Sun,* 1 : 110.

[53] Mitford, A. B., *Tales of Old Japan,* 2 : 260.

[54] Hartland, E. S., *The Legend of Perseus,* 2 : 91.

[55] *Publications of the Folk-Lore Society, County Folk-Lore,* 3 (1903) : 159; *Choice Notes from "Notes and Queries"* (London, 1859), p. 38: cf. Thiselton-Dyer, T. F., *op. cit.,* p. 45.

[56] Hartland, E. S., *Primitive Paternity,* 1 : 109.

[57] Meakin, B., *The Moors,* p. 367.

signs of American Indians appear to belong to a study of symbolism, tabu and religious rites rather than to a study of talisman and charm. These paintings are symbolic, but very rarely may be considered amulets.

Animals as well as men are often protected by a colored talisman. Red string, bits of red cloth, frequently accompanied by pieces of the rowan tree, are tied on animals before sending them out to graze in Scotland,[58] Hungary,[59] Portugal,[60] Norway, Denmark and Germany,[61] and among the Ruthenian highlanders.[62] In the East blue beads or ribbon are so used in Afghanistan,[63] Syria,[64] Macedonia [65] and many other places.

Dwellings as well as the occupants appear to need protection by some device in color. Probably the oldest example is the mark placed on the houses by the Israelites for the Passover.[66] It was blood in this case, but blood was the most available material for a red mark. In later times one finds marks of various shapes and materials placed on houses in Korea,[67] in Borneo,[68] in Jerusalem by Arabs,[69] and in Ireland.[70] In Sicily a pair of horns wound with red cord is placed over the door of a new house.[71] In Syria houses are marked with special signs in red paint, according to the religion of the occupants. Among Christians this usually takes the form of a cross; the Moslems use the sacred palm or the double triangle forming a six-pointed star, and the Jews a more or less crude drawing of the seven-branched candlestick.[72]

[58] Lean, V. S., *op. cit.*, Part I, 2: 452; Thiselton-Dyer, T. F., *op. cit.*, p. 44; Sébillot, P., *op. cit.*, p. 229.

[59] *Folk-Lore Journal*, 2 (1884): 102.

[60] *Folk-Lore*, 19 (1908): 216.

[61] Thiselton-Dyer, T. F., *op. cit.*, p. 68.

[62] Frazer, J. G., *The Magic Art and the Evolution of Kings*[3], 2: 336.

[63] Gray, J. A., *op. cit.*, p. 110.

[64] *Folk-Lore*, 13 (1902): 337; 18 (1907): 70.

[65] Abbott, G. F., *Macedonian Folklore*, p. 144.

[66] Exodus, xii.3, 7, 12, 13.

[67] Rockhill, W. W., "Notes on Some of the Laws, Customs and Superstitions of Korea," *The American Anthropologist*, 4 (1891): 185.

[68] Frazer, J. G., *op. cit.*, 2: 109.

[69] Conder, C. R., *Heth and Moab*, p. 276; *Folk-Lore*, 18 (1907): 66–67.

[70] *Folk-Lore*, 22 (1911): 58.

[71] Sébillot, P., *op. cit.*, p. 205.

[72] Conder, C. R., *op. cit.*, p. 286.

The red hand is found in Ireland and in temples of India, in St. Sophia in Constantinople, as well as in Mexico.[73] In the Punjab one may see a red hand painted on doorposts.[74] A more pleasing but still the same talismanic use of color is to be found in the custom of ornamenting all houses in Lesbos with red flowers on the first day of May.[75] In Japan the blood of a white dog is sprinkled on the entrance gates,[76] but in view of the widespread use of red for the protection of the home one must conclude that the color of the dog is not so important as the red blood symbol. Somewhat different but similar in intent is the marking in red ink of the pauses or stops in the Chinese classics, and even at the present day the Hindus paint at the beginning of their account books a red swastika.[77]

Blue marks, often combined with the "hand of might," are a common sight on buildings of the Near East. In Jerusalem large blue hands are painted on dwellings.[78] In bazaars are to be seen blue amulets, called *buchuk* by the Turks, ready to be strung in garlands and hung on the façades of houses, wound spirally around the masts of ships or nailed to the bow and stern.[79] In Tripoli blue eggs are hung outside the houses [80] and in Palestine blue pottery is suspended in peasant shrines as votive offerings.[81] In Naples the horns of cattle painted blue are fixed to the walls of houses at about the height of the first floor,[82] and in Tibet a turquoise is hung over doors to keep out evil spirits.[83]

In folk medicine treatments for disease at times depend more on a belief in the efficacy of certain colors than on the medicines employed. This is particularly true of red, which is used in a

[73] *Ibid.*, p. 276.
[74] Crooke, W., *Natives of Northern India*, p. 153.
[75] Georgeakis, G., et Pineau, Léon, *Le Folk-Lore de Lesbos*, p. 301.
[76] *Folk-Lore*, 23 (1912) : 188.
[77] D'Alviella, Count Goblet, *The Migration of Symbols*, p. 42; Doolittle, J., *op. cit.*, 2 : 308.
[78] *Folk-Lore*, 15 (1904) : 188–190.
[79] Lean, V. S., *op. cit.*, Part I, 2 : 273.
[80] Conder, C. R., *op. cit.*, p. 286.
[81] *Ibid.*, p. 297.
[82] Park, Roswell, *The Evil Eye, Thanatology and Other Essays*, p. 21.
[83] Waddell, L. A., *The Buddhism of Tibet*, p. 484.

variety of combinations for ailments as different as it is possible to imagine. Sometimes the color is employed for its fancied therapeutic value and sometimes such use is simply homeopathic magic. Frequently the two coincide. Even the doctor may come in a red-wheeled vehicle, in which case he is simply following an old Japanese custom.[84]

In the England of Edward II a room with red hangings and red-clad attendants was supposed to help in the cure of smallpox [85] and scarlet flannel was a remedy for scarlet fever in Ireland [86] and Russia.[87] Red wool bound about the member is a cure for sprains in Scotland,[88] for sore throat in Ireland,[89] and is used as a preventive of fevers in Macedonia.[90] A red thread is a wonderful help to teething children in England [91] and particularly efficacious if it has three mouse heads strung on it, as in old Bohemia.[92] A bit of red coral will keep the teeth from loosening in England [93] and cure all sorts of head troubles in Portugal.[94] If one has a nightmare one should sleep on a red pillow if one adopts the Japanese preventive,[95] or if one has some hidden disease one can discover through dreams the cause and the cure simply by putting a bit of red under one's pillow, according to natives of the Congo.[96] Red thread dipped in the fountain of St. Servien in the Oise district of France,[97] or soaked in a glass of water the contents of which are drunk by Andalusian sufferers,[98] is also highly recommended. In Cornwall this red-

[84] Lloyd, Arthur, *op. cit.*, p. 165.

[85] Black, W. G., *Folk Medicine* (*Publications of the Folk-Lore Society*, 1883), Chap. 7.

[86] *Folk-Lore*, 8 (1897) : 386.

[87] Ralston, W. R. S., *The Songs of the Russian People*, p. 388.

[88] *Folk-Lore*, 20 (1909) : 346.

[89] Lady Wilde, *Ancient Cures, Charms and Usages of Ireland*, pp. 31–32.

[90] Abbott, G. F., *op. cit.*, p. 228.

[91] Wright, E. M., *op. cit.*, p. 248; Browne, Sir Thomas, *Vulgar Errors* (ed. S. Wilkin), Book V, Chap. 24, 5; *Folk-Lore*, 21 (1910) : 223.

[92] Frazer, J. G., *op. cit.*, 1 : 180.

[93] Browne, Sir Thomas, *op. cit.*, Book V, Chap. 24, 5.

[94] *Folk-Lore*, 19 (1908) : 217.

[95] *Op. cit.*, 23 (1912) : 188.

[96] *Op. cit.*, 21 (1910) : 452.

[97] Sébillot, P., *Le Folk-Lore de France*, 3 : 413.

[98] *El Folk-Lore Andaluz*, 1882 83, p. 413; Machado y Álvarez, Antonio, *op. cit.*, 1 : 271.

colored drink is obtained from an infusion of saffron.[99] The red rose, *Geranium robertianum* and *Hypericum androsaemum* are specifics against hemorrhage in Westphalia,[100] as is the "Red Roger" in Ireland.[101] In all these plants either the flower or the leaf or the sap is red.

In folk medicine black is second only to red. Black threads or wool from black sheep are used for similar cures. In Ireland [102] and England,[103] and even in Vermont [103] earache yields to this remedy. In many countries a black snail rubbed on a wart will cure it if the snail be impaled on a thorn afterward.[104] Black and red may be combined in cures through the use of the blood of a black animal. The blood of a black cat cures pneumonia in places as remote from one another as England and South Africa.[105] Black fowl buried at the scene of the first seizure are offered as a cure for epilepsy.[106] The skins of black animals applied while still warm are used for rheumatism and smallpox in France,[107] and the head of a black goat is eaten for night-blindness in Asia Minor.[108] Black hens are sacrificed to promote fertility in Algeria,[109] and the woman of East Central Africa who would be blest with many children wears blue beads and carries a black hen on her back as she would a baby.[110] Among the Hindus the milk of a black cow will rear a healthy child,[111] but in England that of a white cow is better.[112] If a French child has convulsions the breath of a red ox is considered a palliative,[113] whereas the milk of a white mare is a specific for fever in Brittany.[114]

[99] *Choice Notes from "Notes and Queries"* (London, 1859), p. 87.
[100] Thiselton-Dyer, T. F., *op. cit.*, p. 209.
[101] *Folk-Lore*, 8 (1897) : 387. [102] Lady Wilde, *op. cit.*, p. 27.
[103] Bourke, J. G., *The Scatalogic Rites of All Nations*, p. 361.
[104] *Publications of the Folk-Lore Society, County Folk-Lore*, 5 (1908) : 113; *Folk-Lore*, 22 (1911) : 238.
[105] *Folk-Lore*, 6 (1895) : 167; 13 (1902) : 182.
[106] *Op. cit.*, 6 (1895) : 167; 11 (1900) : 446; 13 (1902) : 56; 14 (1903) : 370; 24 (1913) : 384.
[107] Sébillot, P., *Le Folk-Lore de France*, 3 : 130.
[108] *Folk-Lore*, 12 (1901) : 191.
[109] Hartland, E. S., *Primitive Paternity*, 1 : 84.
[110] *Folk-Lore*, 15 (1904) : 73. [111] *Folk-Lore Record*, 4 (1881) : 135.
[112] *Choice Notes from "Notes and Queries"* (London, 1859), p. 244.
[113] Sébillot, P,. *op. cit.*, 3:131. [114] *Ibid.*

Yellow, by sympathetic magic, is naturally a cure for jaundice. The yellow bark of the barberry, turmeric powder, celandine,[115] sulphur and even yellow soap [116] are all used as remedies of the sympathetic type, but perhaps the limit is reached in the English remedy of a spider — probably a yellow one — rolled in butter.[117] Amber beads appear often on the list of folk medicines, but it would seem that it is the material and not the color which contains the curative properties, for the directions for the use of amber are frequently accompanied by the caution that the amber must be real.

I have found only one notation of blue and one of green used in a cure. Both come from Ireland, where a blue ribbon may be wound around the neck as a cure for croup [118] and where indigestion may be relieved by measuring the waist with a green thread in the name of the Trinity and eating three dandelion leaves on a piece of bread and butter for three mornings.[119]

Hundreds of instances of the use of color in folk medicine might be cited, but enough have been given to show the frequency of such use and to demonstrate the vast preponderance of the employment of red or of black and red in the form of blood.

Charms to protect from evil or to prevent and cure disease almost always demand red or black. A red heart is worn on the breast in Spain [120] to overcome illness which is the result of a curse. To stop bleeding a piece of scarlet worsted is tied about the wrists and throat; an incantation is muttered in Ireland;[121] in Scotland the thread may be black.[122] Soon after birth a Macedonian baby is protected from evil by tying on the bedroom door a skein of red yarn to bind the evil.[123]

Ireland seems to be particularly fond of the use of black

[115] Thiselton-Dyer, T. F., *op. cit.*, p. 213.
[116] Lady Wilde, *op. cit.*, p. 19.
[117] *Folk-Lore Record*, 1 (1878) : 45.
[118] *Folk-Lore*, 8 (1897) : 390.
[119] *Op. cit.*, 23 (1912) : 474.
[120] Machado y Álvarez, Antonio, *op. cit.*, 2 : 87.
[121] Lady Wilde, *op. cit.*, p. 14.
[122] Chambers, R., *Popular Rhymes of Scotland*, New ed., p. 349.
[123] Abbott, G. F., *op. cit.*, p. 124.

animals in charms. The liver of a black cat is recommended in a love potion.[124] In an old charm to make one invisible a black raven's heart is split with three cuts by a black-hafted knife and a black bean is placed in each cut. The whole is then planted. When the beans sprout one is to be held in the mouth while the following incantation is repeated:

> By virtue of Satan's heart,
> And by strength of my great art,
> I desire to be invisible.

As long as the bean is kept in the mouth it is assured that one will be invisible.[125] Here the use of the color is a good example of sympathetic magic. Black-handled knives are also used in the preparation of charms in the Southern Sporades to keep away both monsters and bothersome ants.[126] From the Aegean Islands comes this charm for dispelling a waterspout at sea. A cross is made with a new, black-handled knife while one recites the beginning of the Gospel of St. John.[127] In Ireland a storm may be quelled by burning the pelt of a black dog and scattering the ashes down the wind.[128] The Indians of Peru starved and later killed black sheep to weaken their enemies.[129]

Charms to protect one from the visits of a ghost, particularly the ghost of an enemy one has killed, are generally red or red and black. For this, tribesmen of British East Africa smear red and black powders over their bodies;[130] in the Fiji Islands the successful warrior is smeared with red from his hair to his heels.[131] The Ba-Yaka warrior of the Congo Free State wears the red tail feathers of the parrot in his hair and paints his forehead red;[132] the

[124] Lady Wilde, *Ancient Legends of Ireland*, p. 151.
[125] *Op. cit.*, p. 194.
[126] *Folk-Lore*, 10 (1899) : 163, 177.
[127] *Op. cit.*, 18 (1907) : 331.
[128] *Op. cit.*, 23 (1912) : 189.
[129] *Op. cit.*, 15 (1904) : 151.
[130] Routledge, W. S. and K., *With a Prehistoric People: The Akikúyu of British East Africa*, p. 270.
[131] Williams, T., *Fiji and the Fijians*, Part I, 42–43; Frazer, J. G., *Taboo and the Perils of the Soul* [3], p. 179.
[132] Frazer, J. G., *op. cit.*, 3 : 186, note.

Masai, the Borâna Gallas and the Wagogo tribes of Africa also use red or red and white body paint,[133] while a Kaffir who has killed a lion also paints himself red to be free from the vengeance of the king of beasts.[134] Lapp hunters, after killing a bear, used to have their wives spit the red juice of alder bark upon them on returning from a hunt.[135]

Yellow rice is used in West Borneo to preserve the soul of one who has had a great fright or escaped a serious peril.[136] In the southern Celebes the natives think that a bridegroom's soul is liable to fly away at marriage. To prevent this red or yellow rice is scattered over him.[137] A straying lover may be brought from any distance by sticking pins in a piece of red flannel which has been sprinkled with "dragon's blood" (resinous exudation of *Calamus draco*) and later burned while a charm is repeated,[138] and any maid will follow a youth if the names of both are written with the blood of a white hen and the girl is touched with the paper.[139] In Lesbos if a young girl can take the measure of a young man with red string and then wear the string afterward, he will always think of her.[140]

I have found only one case of green used in a preventive charm. In Andalusia it is considered a good thing to have about the house a green-colored candle which has been blessed in church. When a thunderstorm comes up this should be lighted to prevent the lightning from striking the house.[141]

Evil as well as beneficial charms may be prepared with the same colors. In Ireland knots tied in a red handkerchief by an enemy at a wedding can cause dire results.[142] Red enters into spells to cause death to one's enemies in American Negro, Italian,[143] Senegambian,[144] Australian,[145] and Hindu[146] sorcery. One finds black

[133] Frazer, J. G., *op. cit.*, 3: 186 note.
[134] *Ibid.* [135] *Ibid.*, p. 221. [136] *Ibid.*, p. 35. [137] *Ibid.*
[138] *Folk-Lore*, 20 (1909): 221. [139] *Op. cit.*, 21 (1910): 376.
[140] Georgeakis, G., et Pineau, Léon, *op. cit.*, p. 347.
[141] *El Folk-Lore Andaluz*, 1882–83, p. 411.
[142] Lady Wilde, *op. cit.*, p. 212.
[143] Duff-Gordon, Lina, *Home Life in Italy*, p. 240.
[144] Bérenger-Féraud, L. J. B., *Les Peuplades de la Sénégambie*, p. 277.
[145] Frazer, J. G., *Taboo and the Perils of the Soul* [3], p. 126.
[146] Caland, W., *Altindischès Zauberritual*, p. 164.

used for similar purposes in Ireland,[147] by the Malays,[148] and frequently by primitive tribes in all parts of the world. I have found yellow so used only by a Cherokee medicine man.[149] Three threads of different colors have sometimes been employed by Scotch witches.[150]

In divination three colors are prominent, blue, red and yellow. Clews of blue yarn are used in Hallowe'en divination in Scotland [151] and England.[152] This is probably connected with the idea of loyalty and true love represented by blue in the British Isles, as seen in the blue worn as part of the bride's dress. It does not seem to be at all common in divination in other parts of Europe, although blue and yellow choosing strings are found in Italian divination books.[153] In Ireland a bit of red fabric is baked in the Hallowe'en cake.[154] The crimson and purple *Sedum telephium* is used in love divinations in England, Germany and Switzerland.[155] Red is particularly prominent in divination in Greece in the Sporades [156] and in Lesbos, where fortunes are told by tokens taken from a jar covered by a red cloth, the oracle being read by a boy with a red hood over his head.[157]

In the midsummer festivals of central Europe yellow is a favorite color in divination. Perhaps this is because of resemblance to the yellow color of the summer sun, perhaps because yellow flowers are traditionally distasteful to witches.[158] Mountain arnica (*Arnica montana*) and hawkweed (*Hieracium pilosella*) appear to be most commonly used, together with St.-John's-wort (*Hypericum perforatum*).[159] The latter, however, gives out a red

[147] *Folk-Lore*, 22 (1911) : 51.
[148] Skeat, W. W., *Malay Magic*, pp. 568–580.
[149] Mooney, J., *Sacred Formulas of the Cherokees*, *Seventh Annual Report of the Bureau of Ethnology*, p. 392; Frazer, J. G., *op. cit.*, pp. 287–288.
[150] Dalyell, J. G., *Darker Superstitions of Scotland*, p. 306; also cf. Vergil, *Eclogues* 8.78–80.
[151] Frazer, J. G., *Balder the Beautiful*, 1 : 235.
[152] Brand, J., *op. cit.*, 1 : 81.
[153] Rocquain, Felix, "Les Sorts des Apôtres," *Bibliothèque de l'École de Chartres*, 41 : 457.
[154] *Folk-Lore*, 22 (1911) : 205.
[155] Frazer, J. G., *op. cit.*, 2 : 61.
[156] *Folk-Lore*, 10 (1899) : 155.
[157] *Ibid.*
[158] Thiselton-Dyer, T. F., *op. cit.*, p. 58.
[159] Frazer, J. G., *op. cit.*, 2 : 54–60.

juice when squeezed. In Germany, on the other hand, the marigold is excluded from flowers by which young women test their love affairs.[160] In Poland a black cat is held over the fire to bring one's future husband,[161] and in Ireland the first egg laid by a black pullet and baked in a cake will cause one to dream of one's mate.[162]

In omens black and white are the chief colors to be considered; others appear very rarely or not at all. This is natural because in omens only the two extremes of good and bad luck, propitious and adverse conditions, are predicted. Augury never predicts medium success or partial ill fortune, and consequently the superstitious naturally choose the two colors farthest apart.

In general, as one might suspect, black is considered adverse and white favorable, but neighboring counties and even neighboring towns may provide a contradiction. In Spain, to see a white *paloma* (the insect, not the dove) denotes good luck in many places, and the black *paloma*, bad luck.[163] The white moth is a harbinger of death in Castile, but of good luck in Galicia.[164] In Yorkshire fishermen meeting a person wearing white will wait a tide before putting out to sea.[165] In Northumberland the same thing happens if they meet one wearing black.[166] These two counties are separated by less than fifty miles. To dream of a black bull (and not tell about it) is a prediction of success in the lottery in Spain,[167] whereas a dream about black animals is a bad omen in Asia Minor.[168] White owls and other white animals give death warnings in West Sussex (England),[169] whereas this message is intrusted to the raven and other black birds in Suffolk and Jamaica.[170] An old refrain from England says,

[160] Thiselton-Dyer, T. F., *op. cit.*, p. 276.
[161] *Folk-Lore*, 12 (1901) : 193.
[162] *Op. cit.*, 5 (1894) : 190.
[163] Machado y Álvarez, Antonio, *op. cit.*, 1 : 227.
[164] *Op. cit.*, 4 : 88; cf. Selgas y Carrasco, José, *La Mariposa Blanca.*
[165] *Publications of the Folk-Lore Society, County Folk-Lore*, 6 (1912) : 26.
[166] *Op. cit.*, 4 (1903) : 9.
[167] Machado y Álvarez, Antonio, *op. cit.*, 1 : 244.
[168] *Folk-Lore*, 12 (1901) : 191.
[169] *The Denham Tracts* (*Publications of the Folk-Lore Society*), 2 : 193; *Folk-Lore*, 20 (1909); 10 (1899).
[170] *Publications of the Folk-Lore Society, County Folk-Lore*, 1 (1895) : 5.

When the cat of the house is black,
The lasses of lovers will have no lack,[171]

and another,

Kiss the black cat, an' that'll make ye fat;
Kiss the white one, an' that'll make ye lean.[172]

In Spain, however, it is bad luck to have a black cat in the house,[173] and in Persia the black cats are jinn.[174] Among theatrical people in the United States and in England a black cat in the theater is thought to bring good luck to a new production,[175] and in Japan sailors keep a black cat to foretell the weather.[176]

White and black animals of the same species frequently give predictions of a contrary character. In the Orkneys, if the first lamb seen in the season be white, the season will be lucky; if black, it will be unlucky.[177] In Gloucestershire the same belief holds for the first butterfly.[178] In Malta a white hawk-moth betokens the return of a wanderer, a black one the arrival of sad news.[179] Among the Jamaica Negroes if a black beetle comes to the house and flies away good news will be received; if it stays the news will be bad.[180] In some parts of Scotland if one sees the first black snail of the year on a soft substance, the year will be fortunate; if on a hard material, dire events are foretold.[181] Illustrations of augury by black and white might be multiplied indefinitely, but these will suffice to show the general confusion of such omens.

Of other colors, yellow is considered decidedly unlucky. This is rather surprising when it is noted that yellow is frequently used in divination. No young Englishwoman should pick up a yellow

[171] Northall, G. F., *English Folk Rhymes*, p. 160.
[172] Lean, V. S., *op. cit.*, Part I, 2 : 277.
[173] Machado y Álvarez, Antonio, *op. cit.*, 1 : 232.
[174] *Folk-Lore*, 12 (1901) : 263.
[175] *Op. cit.*, 1 (1890) : 276.
[176] *Op. cit.*, 12 (1901) : 70.
[177] *Publications of the Folk-Lore Society, County Folk-Lore*, 3 (1901) : 17.
[178] *Op. cit.*, 1 (1892) : 51.
[179] *Folk-Lore*, 14 (1903) : 85.
[180] *Op. cit.*, 15 (1904) : 208.
[181] Gregor, Rev. W., *Notes on the Folk-Lore of the North-East of Scotland* (*Publications of the Folk-Lore Society*, 1881), p. 148.

crooked pin lest she die an old maid.[182] In the theatrical world yellow posters, yellow labels on trunks, or even a yellow clarinet in the orchestra, is enough to ruin the chances of a successful production.[183] When a Teton Indian is on a journey and meets a yellow or gray spider, or one with yellow legs, he must kill it, else evil will befall him.[184]

Blue appears very rarely in omens. In the Punjab to see or hear a blue jay is good luck,[185] and in the Hebrides to dream of something blue is said to portend good fortune.[186]

SUMMARY

It is evident from the foregoing examples that the two great talismanic colors are red and blue. Where black appears it is frequently combined with one or the other of these two colors, especially with red in the form of blood. Even in these cases, because of its association with sorcery, black is more of a magic than a talismanic color.

At first glance the world-wide distribution of red and blue as the principal colors in the uses mentioned above would appear to be about even. When these are plotted on a map several interesting features appear. Red is of much wider distribution than blue. Most of Europe, practically all China, Japan and India, Indo-China, Borneo and Sumatra and a considerable part of Africa show red as the talismanic color. Blue predominates over red in the Near East, Greece, Turkey, Morocco, southern Spain and southern Italy. In England and Ireland blue and red run a close race, with red slightly in the lead. Naturally, in the predominantly red area one finds scattered examples of the use of blue in talisman and charm and vice versa. The situation in the Western Hemisphere is not clearly defined and would seem to prove by this very lack of definition the points I shall consider in my explanation of the reasons underlying the use of these two

[182] *Folk-Lore Record*, 1 (1878) : 33.

[183] Told to me by an actor, Mr. Walter Townsend.

[184] Dorsey, J. Owen, "Teton Folk-Lore Notes," *Journal of American Folk-Lore*, 2 : 134.

[185] *Folk-Lore*, 21 (1910) : 216.

[186] *Op. cit.*, 13 (1902) : 52.

colors as talismans. In the New World there are very few reliable data. The Indians of both North and South America used colors as symbols rather than as talismans. The conquering peoples who succeeded the Indian civilizations are almost entirely European and as such brought their own folklore to their new homes. This is particularly true of the English and Irish along the Atlantic Coast, the Germans in Pennsylvania, the French in Louisiana and the Scandinavians in the north-central states. In the southwest, Spanish civilization left its mark on folklore as well as in other fields. West of the Mississippi these elements united to produce a still more confusing result. In South America more or less parallel conditions obtained, with a greater admixture from Italian and Portuguese sources. For these reasons both the color usage and its distribution in the Western Hemisphere may be interesting, but it is untrustworthy.

In a previous article [187] the writer showed that red gained its properties from its association with fire and the worship of fire as divine. From this association with deity it came to represent deity and later assumed the attributes of the godhead. An example of this association of red, divinity and fire, is seen in China when the image of the temple god is carried in a sedan chair painted red at fire ceremonies in connection with the vernal festival.[188] Likewise, in certain Hindu ceremonies the vehicle carrying the image of Siva is painted red; [189] in others the footprints of Gauri, Siva's wife, are marked on the floor with red paste.[190] Because red represents divinity it becomes a symbol of the majesty of kings, a purifier, a healer, an avenger, a protector of the initiated, a guardian of the home and its flocks; in short, it exercises the functions of a god.

In the employment of red at initiation ceremonies at puberty, in its use in aprons for the protection of reproductive organs, this color represents another aspect of divinity mysterious to untu-

[187] Kenyon, H. A., "The Protective Power of Red," *Pap. Mich. Acad. Sci., Arts and Letters*, 5: 29–35.

[188] Frazer, J. G., *Balder the Beautiful*, 2: 4.

[189] *Folk-Lore*, 25 (1914): 154.

[190] Dalton, E. T., *Descriptive Ethnology of Bengal*, p. 261.

tored man — reproduction.[191] A fanciful story of the ancestry of the Manchu dynasty represents this aspect of red. After bathing, a heavenly maiden finds on the skirt of her raiment a red fruit, placed there by a magpie. She eats the fruit and later is delivered of a son destined by heaven to "restore order to disturbed nations." [192] In some form this tale is common in eastern Asia. Another example is the prominent part played by red in circumcision paraphernalia in India and Beluchistan.[193] Here it is evident that red represents the male principle as well as divinity, and it is interesting to note that red practically always represents a male god.

There was another great mystery to those living in such a location as to be affected by it; that was the sea. Moreover, those peoples of the Orient who live far removed from the sea have always had a great passion for water because of its scarcity. The blue of water combined with the blue of the sky became naturally the second symbolic color. During their wanderings in the wilderness, the Ark of the Jews was covered with a blue cloth when on the march; a cloth of blue was placed upon the table of shewbread, over the sacred candlestick and on the altar.[194] In the East the worship of a sea deity was early associated with the worship of Aphrodite under many forms and names. This worship of a female divinity as a sea deity logically gave to blue a symbolic connection with an outstanding female deity and hence a talismanic power second only to red, which represented the male deity. Now it is interesting to note that the great concentration of blue as a talismanic color is around the Mediterranean Sea and particularly at the eastern end. This was, of course, the center and source of the Aphrodite cult.

From the eastern Mediterranean this worship, and with it blue as a talisman, extended east into Persia and Afghanistan, spread-

[191] Frazer, J. G., *op. cit.*, Vol. 1, Chap. 2; *Folk-Lore Journal*, 3 (1885): 317; Dennett, R. E., *Notes on the Folk-Lore of the Fjort* (*Publications of the Folk-Lore Society*, 1897), pp. 20, 137.

[192] Hartland, E. S., *Primitive Paternity*, 1: 5.

[193] Bray, Denys, *Report of the Census of Beluchistan for 1911*, p. 61; *Folk-Lore*, 24 (1913): 228.

[194] Numbers, iv.5–12.

ing thence into India on the south and Tibet and China on the north. Westward it was carried along the northern coast of Africa to Tripoli, Tunis, Algiers and Morocco, and on the northern side of the Mediterranean into Spain and Italy, where the association of blue and the sea is seen in the *caeruleae vittae* with which victims dedicated to sea deities were adorned.[195]

When Christianity replaced the pagan deities of the Mediterranean, many of the attributes of the older goddesses became a part of the cult of the Virgin Mary. Blue became so thoroughly associated with her that a blue mantle or robe is an indispensable part of her attire in religious art. Dante refers to her symbolically as "the beautiful sapphire." [196] Such developments as are found in France, England and central Europe probably came through the connection of blue with the Virgin Mary.

From these usages in several religions came the protective significance of red and blue. Men of earlier civilizations sought to place themselves *en rapport* with their deities through the colors which represented them, and modern man has continued the custom, seeing in the color a talismanic significance and virtue, though ignorant of its source in religious symbolism.

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[195] Armstrong, Mary E., *The Significance of Certain Colors in Roman Ritual*, p. 2, quoting Valerius Flaccus, *Argonautica*, 1.188 ff.
[196] Dante, *La Divina Commedia*, Paradiso, 23 : 101.

THE WEAPONS OF THE ASAHAN BATAKS

CARL D. La RUE

ONE who travels beyond the immediate path of the tourist in the East Indies is at once struck with the universal habit of the natives of carrying weapons. At first one feels some apprehension at being asked to lead the way down a jungle path with a dusky native treading almost on one's very heels and swinging the naked blade of a murderous knife. But after a time a measure of confidence comes, and one forgets that the knife is there, or better, realizes that the knife is not for him, but for the jungle, which must be fought back from the paths daily and hourly if they are to be maintained in a passable condition. As the native walks along he lops off overhanging branch and uprising shoot, so that every few steps the knife is brought into play. Should one desire a piece of wood from the trunk of a tree the knife is used; if a plant must be dug up the knife serves as a spade; and in a multitude of ways the knife is employed and appears the most useful implement which the jungle man has in his possession.

One soon realizes that there are a number of other types of knives in addition to the big one which the native may carry, or use about his dwelling. Some of these are worn mainly for display, though on occasion they may be wielded with deadly effect in a brawl. Some are for ceremonial purposes only, and still others are employed in household tasks or in making carvings of a delicacy seemingly impossible with such crude tools.

The Asahan Bataks are a little-studied and nearly extinct tribe of the East Coast country of Sumatra, where the author came into more or less close contact with them over a period of three years. During this time a collection of their weapons was assembled, a task by no means easy because the small number of members of the tribe meant that there were not many weapons to be had.

Also, the waning of the tribal spirit before the inroads of civilization and the general poverty of these people had led them to sell or trade the typical tribal weapons for other goods, or for more common knives used by the Malay or the Javanese dwellers of the region. During a part of his sojourn in Sumatra the writer had in his laboratory a *krani*, or "helper," who was by birth an Asahan and who had been trained as a *guru*, or "teacher," in his tribe. This man, Ramit, alias Limah Bidin Sirait Holboeng, not only knew what were the traditional weapons of his people but was able to secure them for the writer from friends or relatives in distant villages. Many of the knives, which constitute the most common weapons, are very old and had long lain unused about the houses. Because of the age of the knives, and probably also because of the fact that the handsome and ornate weapons had been sold as the pinch of poverty had been felt, the collection has no great claim to beauty. The tribe has little contact with the tourist and its members have not had the stimulus to make new copies of their weapons for sale, as the neighboring Toba and Karo peoples have done. In general, the people have not even realized that the weapons had a sale value, and indeed most of them would not tempt anyone as curios, but one can only be glad for this, since it has made possible a collection which would otherwise not have been gathered.

It is doubtful whether so full a collection of the weapons of this particular tribe exists elsewhere, because most of the planters, who make up nearly all the European component of the population, have not recognized the fact that these people are not Malays. Usually, when the Bataks have been converted to Mohammedanism, as most of them have, they call themselves Malays. These people have passed as Malays and until quite recently no one has been interested in a special study of their manners, customs, utensils and other things. It is not likely that enough of the old weapons exist to make up another representative collection. This fact supplies a motive for this paper by one who makes no claim to the status of an anthropologist.

The weapons of the natives of North Sumatra have been treated at some length by Volz (2) in his work on that territory. Volz,

however, did not come into contact with the Asahans and though he does give attention to the Toba Bataks, from which tribe the Asahan Bataks are probably derived, there are many names used for knives by the Asahans which are not recorded by Volz, if indeed they are used by the Tobas at all. Therefore, it is not possible to find the Toba counterparts of all the Asahan knives, but comparisons will be made wherever our limited knowledge renders this possible.

MATERIALS OF CONSTRUCTION

The blades of the knives and spears are of native steel, which is made by laying down layers of iron and charcoal and then forging the laminae together. In some blades the result is very good, though rarely as good as the work of the Achinese, who are extremely skilful workers of steel. In other blades the result is poor and the blade is soft, or the laminae tend to separate from one another. However, the greater part of the weapons are sufficiently well tempered to make the weapons formidable. The hilts are usually of hard woods, which are very strong and durable, although the wood may check considerably with age. Since they have been kept in the drier climate of Michigan most of the wood hilts have checked quite badly. The woods of the hilts are usually fine in appearance and in some of them rare woods are used, such as the *kayu kamuning*, which is much prized by the Malays.

Another material which is employed extensively is horn, usually that of the caribou or water buffalo. As will be noted later, the use of this substance has been supposed to influence the shape of the hilts of certain knives, though the writer is inclined to discount this influence. Two other materials of animal origin are often used, namely, bone and ivory. Bone is not seen on many of the weapons and seems to be placed only on the smaller knives. Ivory likewise is not used on the larger knives, but is rather common on the smaller ones.

The blades are forced tightly into the hilts and cemented in place by gambier or some other gum. The hilts may be provided with ferrules of metal, which in the Asahan weapons is usually silver. For some reason the Asahans rarely make use of copper,

which is seen on so many of the knives and swords of the Karo Bataks. Ferrules of bone and of buffalo horn are frequently encountered, but many knives have no ferrule, although one may be suggested by a ring carved in the substance of the hilt.

The hilts are usually ornamented with carving, which is often an integral part of the design. The carving is particularly well developed in many of the bird and dragon head designs. In addition to the carving, silver bands or plates may be applied at the end of the hilt or elsewhere.

The sheaths are sometimes only temporary affairs made of soft wood bound together with pieces of rattan or palm fiber, but many weapons show as much care in the construction and ornamentation of the sheath as in the making of the hilt. The simplest types of sheath are made of two pieces of wood so shaped that, when they are put together, a place is left between them into which the blade can be thrust. The sheaths which reveal skill and patience in their construction are usually made of four parts, an upper ferrule or top piece, two side plates, and a lower ferrule or end piece. The upper ferrule is made of a solid piece of material and is pierced to allow the blade to pass through. On the lower side it is mortised to permit tenons from the side plates to be inserted. The side plates are hollowed on the inside, so that a channel for the blade is formed when they are fitted together. Sometimes a single piece of wood is used in place of the two side plates and then the wood must be pierced from end to end for the blade. The side plates, or the single piece, must be provided with tenons at either end to fit into mortises in the ferrules. The lower ferrule is not pierced, but has a mortise cut in it above for the tenons of the side plates. The four pieces are often shaped and fitted with considerable skill and the sheath is quite worthy of the weapon which it guards. The finer sheaths are most common on the smaller knives, such as the *toembuk lada*, which are carried tucked into the belt, waistband or top of the *sarong*, which is a kind of skirt worn by all well-dressed Malays and Bataks. The larger weapons are frequently carried without the sheath, or are guarded by loose-fitting sheaths of soft wood on which little effort is wasted. These are always made of two parts only, so far as Asahan weapons

are concerned. Among the Tobas and the Karos one sees many large knives with sheaths beautifully made and richly ornamented. These are of two parts, but may have a lower ferrule of copper or silver, although the upper ferrule is almost always lacking. Bands of copper or silver are very common on such sheaths.

The sheaths of Asahan knives are usually made of wood, even though the hilt may be of other substance, but entire sheaths of horn are not uncommon. In many examples the three upper parts are of wood and the lower ferrule is of bone or horn. If the bone or horn is hollow, the opening is usually closed by a plug of the same material or of wood. Nicely wrought bands of rattan or palm fiber are used to hold the side pieces together and the tenons are cemented into the mortises with gum. Bands of silver wire are common, but some specimens have wide bands of silver, which may cover nearly all the side plates. The lower ferrules may show shapes in keeping with the general design, but are rarely much carved. The upper ferrules reveal various designs, more or less in harmony with the hilt designs, as will be noted later. These may be elaborately carved.

TYPES OF KNIVES

Volz (2, Vol. 1) divides Batak knives into two classes: those with hilts bent backward away from the edge of the blade, and those with hilts bent toward the blade. The first class is said by Volz to be rare in Sumatra and this is surely true among the Asahan people. Only two types of knives, the *raut* and the *tordjong*, show this inclination of the hilt.

Knives with backward-bent hilt

Raut. — The *raut*, or *rawit*, as it may be spelled, is a small service knife used in and around the house. It occurs in Tobaland and is of similar use there, according to Warneck (3). Volz figures a *raut* from northwest Karoland and three *rawits*, one from Upper-Kwalu and two from Habinsaran. There appears to be no good reason for one spelling rather than the other, and Volz uses both on one plate (Vol. 1, Pl. 102). Volz's classification

breaks down here, since three of the *rauts* he figures have backward-bent hilts whereas the other one has a forward-bent hilt.

The *raut* is a thin-bladed knife, with a back which is straight or nearly straight, having only a slight bend backward. The blade is cut down at the base so as to leave a narrow flat tang on which the hilt is fixed.

Two specimens of the *raut* are included in the author's collection. No. 1 (Pl. V) is a very small knife with a blade 10 cm. long, 12 mm. wide and 4 mm. wide at the back. The tang is 1 cm. wide and 7 mm. long, and the hilt of round bone is 7 cm. long. It is carved with a dragon's head and has only a false ferrule shaped in the bone.

No. 2 is a larger knife, with a blade 16 cm. long, 2.2 cm. wide and only 2 mm. thick. The tang is 1.3 cm. long and 1 cm. wide just back of the blade, but tapers to 7 mm. where it enters the hilt. The hilt is of hard wood and widens out at the end to a sort of six-pointed rosette, called *boenga kiambang*. The hilt is 9.3 cm. long and the ferrule of bone is 8 mm. wide.

Although No. 1 has no sheath, No. 2 has a two-piece sheath of soft wood bound by a single hand of three strands of rattan. There is no carving on the sheath, but it is shaped at the upper end into a three-pointed figure.

Tordjong. — This is the second type of knife with backward-bent hilt. Volz speaks of this weapon as a *tordjong*, but does not describe it, except to say that it has a backward-bent hilt.

Two examples exist in this collection. No. 3 is an old weapon that shows many laminae. The blade is 23.5 cm. long, 2.3 cm. wide at its greatest width, which is just back of the point, and has a thickness at the back which tapers evenly from 8 mm. at the base to 2 mm. near the tip. The tang, which is round, 1.3 cm. in diameter and 3 cm. long, has a rather fine ornamentation beaten into the steel. The hilt is made of black horn, bent sharply backward from the edge of the blade, and is 14 cm. long, the length being measured along the curve. Two bands of silver, each 2.5 cm. wide, ornament the hilt. These bands are without carving, except that the lower one is scalloped at the upper edge. The ferrule is of copper, which is rarely used by the Asahan Bataks, though, as has

been mentioned, this metal is much favored by the Karos. The sheath is made of two pieces of soft wood and is almost entirely covered with two bands of silver, one narrow and the other wide.

No. 4 is a very graceful *tordjong*, with fine sweeping curves from point of blade to base of hilt. It is lighter and in every way finer than No. 3. The dimensions of the blade are: length, 16.5 cm.; greatest width (near the tip), 1.9 cm.; thickness of back, an even taper from 3 mm. at the base to 1 mm. near the tip. The tang is 1.6 cm. long and 4 mm. thick. It is wider (1 cm.) at the hilt than at the base of the blade (8 mm.). The base of the blade has a short guard in the shape of a prong about 1 mm. long. The hilt is of black buffalo horn and widens from a diameter of 1.3 cm. at the ferrule to one of 3.7 cm. at the end. The outer end terminates in a six-pointed *boenga kiambang*, with a steel prong protruding from it. The hilt proper is 10 cm. long and the prong is 3.3 cm. long. The outer end of the hilt is incased in silver beaten around the points of the *boenga kiambang* and there is a handsome silver ferrule 2 cm. wide. (See Volz 2, Vol. 2. Fig. 107.)

The hilts of both Nos. 3 and 4 are called *kapala hinata*. *Kapala* means "head" and is a general term for a knife hilt. What *hinata* means the author has been unable to discover. It is not given in Warneck's Toba vocabulary (3). Presumably, both hilts are of the same type, but one has a pointed horn. The other is not pointed at all unless the steel prong is intended to carry out the idea, as it does in a fashion. What other purpose the prong may have is uncertain; possibly it has a magical significance, but one must be chary of assuming this. Some persons explain every doubtful thing in such a fashion although the truth, if known, may show the idea to be grotesque. It seems strange that the name *boenga kiambang* ("*kiambang* flower"), which is applied to the hilt of No. 2, is not given to that of No. 4, for the shape is the same except for the prong. Evidently the prong carries out the idea of the long pointed tip, so that the hilt becomes a *hinata*.

The sheath of No. 4 is of two pieces of hard wood bound by a wide (6 cm.) silver band much battered and broken at the top. The top of the sheath is shaped to a three-pointed figure. A band

of two strands of rattan binds the top of the sheath. This appears to be a recent addition put on to protect the sheath from a split which has appeared at the top.

It appears to the author that the *hinata* hilt is related to the *rendjong* of the Achinese. Nos. 5 and 6 are examples in the author's collection, but they are Achinese. So far as could be determined, this weapon does not occur among the Asahan Bataks. Volz considers the *tordjong* a form of the *rendjong*. To the writer, the blades of the two knives do not offer the same resemblance as do the hilts. The hilt of No. 3 is surely much like those of Nos. 5 and 6. The *rendjong*, besides being one of the most murderous fighting weapons, which it is a penal offense to carry in Sumatra, seems to have a wide use as an *adat* or "ceremonial knife." The elaborate ornamentation of Nos. 3 and 4 on both hilt and sheath suggests a ceremonial or display function. The *tordjong* is not to be compared with the *rendjong* as a fighting blade. It is awkward rather than otherwise, whereas the *rendjong* is a model of efficiency for its purpose. It is doubtful whether there is a more diabolical knife in existence. Its hilt gives a wonderful grip and its thin razor-edge blade can be driven with a peculiar backward stroke of tremendous force. With its lifting thrust, a proficient fighter can cut through the entire viscera of a man from lower abdomen to throat in a single stroke. No one can imagine such a feat being performed with a *tordjong*.

Knives with forward-bent hilt

Most of the Asahan knives have hilts of this type. The different forms included here are the *badik*, the *bolado*, the *golok*, the *goepuk*, the *toembuk lada*, the *halasan*, the *hangan*, the *simoenoeng*, the *alamang* and the *koerambit*.

Badik. — This is generally a small knife used mostly in the same way as a jackknife is used by us. The blade is straight and thin, with both back and edge usually ground down to form the point.

No. 7 is a very old weapon in which the laminae are conspicuous. Apparently, a small amount of silver has been placed between the laminae. The blade is 18 cm. long and retains a width

of 1.6 cm. from the hilt out to within 3 cm. of the tip, where both back and edge begin to curve to form a point. The thickness is 2 mm. There is no tang visible in this or any of the other *badiks;* the blade keeps its full width up to the hilt. The hilt is beautifully shaped of black buffalo horn and is 9 cm. long. It is curved and flattened and has an ornamental false ferrule carved in the single piece of horn. The sheath is of two pieces of buffalo horn, with an end piece of hard brown wood, which is pointed and set into V-shaped cuts in the two horn side pieces. This type of end piece is not seen in any other specimen in the collection. The sheath is bound with two braided bands of rattan. No. 8 is very similar to No. 7 in shape, but the tip is slightly different, since the back tapers to the point in a straight line instead of in a curve, as in No. 7. The blade is laminated without silver and is almost identical in size with No. 7. The hilt is much like that of No. 7, but is inferior in design. The curves are not so good and the false ferrule is less ornamental. This hilt is made of a hard brown wood, and the side pieces of the sheath are of a hard reddish brown wood. The end piece is of bone, which is hollow. The side pieces extend as tenons into the hollow, thus forming a plug at the end. The upper end of the sheath is ornamented with a graceful leaf carving. The sheath is bound with six silver bands set in two groups. Each band is made of two strands of wire.

No. 9 is a gem of knife construction. The blade is 10 cm. long, 1.5 cm. wide and 1 mm. thick. The back is straight throughout its length and the point is formed by the upward curve of the edge. The hilt is 5 cm. long and is made of the rare and beautiful *kamoening* (*Murraya sp.*) wood finely carved. The sheath is also of *kamoening* wood and is made in four pieces, as are only the finest sheaths. The joining and carving are very fine. This handsome little knife was the property of a small Asahan girl.

No. 10 is a doubtful specimen. The blade is *badik* in shape, but differs from the type in its larger size, 25 cm. long by 2.3 cm. wide, and by its thick back, 9 mm. at the base and tapering to 1 mm. at the tip. The hilt is of hard, dark red wood and is finely carved in a peculiar design which will be discussed later. It is 11.5 cm. long. There is a false ferrule, rudely carved as compared

with the rest of the hilt, which suggests that there was once a ferrule of other substance which covered it. The sheath is of two pieces of hard red wood carved in a leaf design at the upper end. It is bound by a single band of braided rattan.

No reference to the *badik* is found in Volz, nor does Warneck give the word in his vocabulary, but it is hardly likely that a type so common as this in one tribe can be unknown to related tribes.

Bolado. — This is another small knife which is much used by the Asahans. It is rather difficult to distinguish the *bolado* from the *toembuk lada*, which will be discussed next. It seems that the blade of the *bolado* is a little lighter than that of the *toembuk lada*, that it is slightly less curved, and that the point is longer than that of the latter. Also the *bolado* usually has at the base of the blade a little guard which is absent from the *toembuk lada*.

No. 11 is a very handsome knife, and blade, hilt and sheath are all beautifully finished, though there is no elaborate carving. The blade is 18 cm. long, 1.9 cm. wide at its base and 7 mm. thick at the base. There are two deep, longitudinal grooves parallel to the back in each side of the blade. The tang, which is round, is 1.8 cm. long and 1.2 cm. in diameter. The hilt is of a very hard black wood and is 6.5 cm. long. The sheath is made in three pieces. There is no end piece, but the side pieces are hollowed out and fitted together to make a closed sheath. The top piece is of black wood like that of the hilt, but the side pieces are of a red wood. Two braided rattan bands encircle the sheath near its middle, and a silver band 2.5 cm. wide is fitted just below the top piece. This band is ornamented with a floral design in relief.

No. 12 is much like No. 11, but is not so well made. The blade is 16.4 cm. long, 1.8 cm. wide at the base and 6 mm. thick at the base. There is only one longitudinal groove on each side of the blade. The tang is heavier than that in No. 11, but of the same length. The hilt is 5 cm. long and is made of a rather soft wood. This knife has no sheath.

No. 13 is a small, but very strong knife. It is possible that it was once much larger and that it has been worn down to its present size by long use. The heavy base and the general appear-

ance of age give weight to this supposition. The longitudinal grooves on the sides of the blade are very shallow and the guard at the base of the blade is nearly gone. The blade is 10.9 cm. long, 2 cm. wide at the base and 7 mm. thick at the base. The tang is 1.6 cm. long and heavier than that of either No. 11 or No. 12. The hilt is 5 cm. long and is made of ivory which has turned brown from age. The sheath is a simple two-piece affair made of soft wood. It is bound by one braided rattan band and is stained with betel juice, or possibly with the dye from teak leaves.

It may be that the *bolado* is only a local variation of the *toembuk lada*, since no reference to its use elsewhere has been found.

Toembuk lada. — This is the most widely used dagger in Sumatra, since it is a favorite weapon with the Malays as well as with many of the Batak tribes. Its resemblance to the *bolado* has already been noted. Volz believes that the *toembuk lada* has been derived from the Achinese *rendjong*, as has the *tordjong* also, according to his idea. The blades are not dissimilar, though the *rendjong* has a thinner blade. The hilt form is entirely different and the method of use, which is determined by the shape of the hilt, is also very different. The stroke of the *toembuk lada* is made downward and is so aimed that the blade passes back of the clavicle and down to the heart. It is more difficult to make the proper stroke with the *toembuk lada* than to give the disemboweling stroke of the *rendjong*, but the hilt of the *toembuk lada* does not admit of the latter stroke. There is no question, however, that the *toembuk lada* is a formidable weapon.

No. 14 is the most beautiful knife which the writer has ever seen. From every point of view blade, hilt and sheath show graceful curves, fine workmanship and beautiful ornamentation. The blade is 18 cm. long, 2 cm. wide at the base and 1 cm. thick at the base. It is finely made, with only very thin laminations showing. The shape is exceedingly good, with flowing curves and fine balance. On each side of the blade there are two deep grooves, which do not run exactly parallel to the back, but follow a course harmonious with the design of the blade. The tang is 1.1 cm. long and 1 cm. in diameter in its thickest part next to the hilt.

The hilt and the sheath are both superbly shaped from black

buffalo horn. The length of the hilt is 6.5 cm.; like so many of these knives it is small for our hands, but it must be remembered that the hands of the people who use these knives are small, so that these hilts are adequate for their users. The end of the hilt is carved with a conventional representation of the *boenga hoenik* ("*hoenik* flower"). Bartlett (1) identifies this plant as *Curcuma zedoaria* Rosc. The flower appears to come out of a conventionalized dragon's mouth and all the details of the connection between the flower and the dragon's mouth are worked out in a masterpiece of design.

The sheath is made in four pieces. The two side pieces are unornamented, being merely curved to harmonize with the general design, but the end piece is both ornamented and curved. End piece and side pieces are cut lengthwise of the grain of the horn, but the top piece is made with the grain running crosswise. This piece is the finest carving which the writer has seen in any East Indian work. The solid block of horn has been pierced to allow the passage of the blade and mortised to admit the tenons on the side pieces, no mean task in itself. Then the piece was shaped to the general design of a top piece, but with the most beautiful curves in every part. Finally, the back of the top piece was carved in a complex of interlacing leaves of wonderful delicacy. The intricacy of the design is remarkable when one considers the crudity of much native design. It seems that the crudest and most primitive designs among the Bataks are representations of animals. The use of floral elements commonly accompanies a much higher conception, but this design stands at the very peak of Batak artistry. The Asahan Bataks have appeared to the writer as the most artistic of all the group, but he has seen nothing elsewhere that proves it so conclusively as this. The leaves are small, curved and convoluted in a variety of ways, but all are graceful, free and spirited in execution. The mass of leaves emerges from a conventional dragon's mouth, which is finely curved, scalloped and ornamented. The whole work becomes more admirable when one reflects that it was all done without any drawing of the design from which to work, and that it was executed in a most refractory material, unusually subject to splitting and cracking, in which one

split would spoil the whole work. It must have been done with a knife less well adapted to such work than one of our ordinary pocket knives. All in all, one can regard it as the work of a genius, in both design and carving. The maker is unknown, but his work was prized by the former owner, the headman of the village of Soengei Boenoet, and it cost more to add it to the collection than did any other item.

No. 15 is a handsome weapon, though the writer was never able to understand the enthusiasm shown for it by every Batak and Malay by whom it was seen. To a man they admired it and wanted to secure it by gift, exchange or purchase. The blade is 15 cm. long, 1.5 cm. wide at the base and 6 mm. thick at the base of the back. It shows irregular and rather thick laminations. The tang is 1 cm. long and 1.1 cm. in diameter at its thickest part, which is next to the blade. The hilt is 6.5 cm. long and is carved with a lifelike representation of a parrot's head. The whole is carved from black buffalo horn, with small ivory insets for the eyes. The beak and crest of the bird are well represented. There is a false ferrule cut from the horn, which is ornamented with cusps and from which an ornamental design runs up the back of the hilt to meet the crest of the bird head. The sheath is of *kamoening* wood, except for the end piece, which is of buffalo horn. The sheath is made of four pieces well fitted and the whole is graceful. The top piece is made crosswise of the grain, pierced for the blade, and is ornamented with a bulbous lump which emerges from a conventionalized dragon's mouth.

Golok. — This knife is spoken of by Volz as having the form of the *golok taka*, which he says is used on the eastern plateau of Sumatra, but he does not describe it. Warneck finds it among the Tobas and spells its name *gulak*. According to his definition, it is a "kap-messer." In the Asahan country the writer found it only in the form of the *golok rembau*. The significance of the name has not been ascertained by the writer, but the knife is much smaller than Warneck suggests. Furthermore, this type of *golok* has the magic property of protecting its bearer from attack by tigers. Hence it is sometimes called the *golok rimau* or *golok harimau*. The word *harimau*, often shortened to *rimau*, means

"tiger." Neither of the specimens in the collection would be of any use against a tiger except by its magic.

No. 16 is a most curious knife, which was obtained after long inquiry and search, and finally after much haggling and the payment of a stiff price. It is quite apparent that the natives believe implicitly in the power of this knife. The blade is 16.5 cm. long and 1.7 cm. wide at the base. The back is straight or nearly so, and the edge is straight until 3 cm. from the tip, where it begins to curve toward the back. It is only 4 mm. thick at the base. It is set in the hilt without a tang, or rather the tang is fully inserted, so that the blade comes up to the hilt. The blade is crudely made and has one roughly made groove along the back on each side.

The shape of the hilt is very unusual. It is curved somewhat like that of the *tordjong* or the *rendjong*, but in the opposite direction. It is 13 cm. long in the line of the curvature. It has a strong resemblance to a sea-horse and the likeness is heightened by eyes made of small pieces of mother-of-pearl. These were cemented on with gambier, but have now been lost. The end is finished with a silver stud of typical Batak design. A ferrule 5 mm. wide, crudely made of silver, binds the base of the hilt, which is made of a hard red wood. The hilt is further decorated by a design pricked out and filled with some white paste. Back of the eye on either side is a five-pointed star scratched in the wood, with the scratches filled with the white paste.

The sheath also is curious. The top piece, bottom piece and one side piece are all hewed from a solid piece of wood, with one side cut away to allow the hollowing. Then the other side piece is fitted in, a type of construction seen in only one other example, No. 10. A rough band of lead encircles the sheath near each end, and one of twisted rattan is seen below the upper one of lead.

The upper end of the sheath emerges from a dragon's mouth, and the tip is roughly carved in an incomprehensible design. This tip is ornamented on either side with a small silver stud, a circle of mother-of-pearl, and a triangular bit of lead, all cemented in place with gambier. Both ends of the sheath are further decorated with rude designs pricked and scratched in the wood and

filled with the white paste used on the hilt. The sheath is made of hard, red wood.

No. 17 is really a *toembuk lada* and has nothing in common with No. 16 in shape of blade or hilt. It came into the possession of the writer on the eve of his departure from Sumatra; otherwise an attempt would have been made to find out why it should be called a *golok rembau*. It was brought in by Bidin, who was mentioned at the beginning of this article, and sworn to by him as an authentic *golok rembau*, in spite of the protest of the author that it was a *toembuk lada*. The desire which the Oriental frequently shows to give the white man what he wants could not have been active here, because there was already in the collection one authentic *golok rembau* which had been there more than two years, and another was not being sought. Also the fact that this first *golok* had been secured at a fancy price could not have caused any deception, since the second one was offered very cheap, no more than would have been paid for it as a rather decrepit *toembuk lada*. Bidin himself could give no satisfactory explanation for the mutation of this knife from its original type to another one, but he vouched for the authenticity of the name and for its magical property as a tiger-repellent as well. The author can only express his doubts and admit that he may have been the victim of a hoax.

The blade, of typical *toembuk-lada* shape, is badly eaten by rust, especially at the tip. It is 15.5 cm. long, 1.5 cm. broad at the base, and 6 mm. thick at the base. A narrow shallow groove runs parallel to the back for the entire length on one side, but on the other side the groove extends only 2.5 cm. from the tang. The laminations show plainly and at the tip some of them have broken away, so that the blade has been damaged in this way as well as by rust. The tang is 1 cm. long and six-sided. The hilt is 6 cm. long and is made of a hard but light-colored wood, which has been stained black by some sort of varnish. The sheath is made of a softer wood stained in the same way as the hilt. It is unique among the sheaths in the collection in that it is all formed from one piece of wood hollowed out from each end. It has now split open along one side. The design, too, is different from that of any other sheath.

Koerambit. — This is a small knife with a curved blade and a hilt with a hole in it through which the index finger is thrust. The other fingers clasp the hilt below the widened portion in which the hole is made and the blade extends downward. However, the point of the blade curves upward when the knife is held in this way, and an upward stroke with it is only slightly less dangerous than that of a *rendjong*. On this account the *koerambit* is like the *rendjong*, a knife which the native may not carry.

Nothing is known of the extension of this knife in Sumatra; Volz does not mention it, and the writer has seen it only in Asahan, except for one example, No. 18, which he purchased in Medan from a peddler who did not know its origin. No. 18 was a new knife when bought and may have been made specially for sale, but aside from the fact that the Asahan Bataks now make no knives, and that it was bought far from their territory, it is obviously not of Asahan type. Hence it may be reasoned that the knife is not limited to the Asahan territory. No. 18 is undoubtedly a *koerambit*, but the blade is not curved sufficiently to make it typical or of any great use in fighting. It is unfit for stabbing and would be ineffective in an upward stroke. It is figured here because it is nearer the true type than the only Asahan *koerambit* in the collection, No. 19. The writer has seen several specimens with the fully curved blades, but was unable to procure one.

No. 19 is a *koerambit* because it shows two characteristics of that knife. One is the perforated hilt and the other the hollow-ground, or, rather, hollow-formed, blade, since the hollow was made by hammering rather than grinding. This hollowed blade is seen in all specimens of this type and not in other knives. No. 18 also shows it. The blade of No. 19 is 11 cm. long, 2.3 cm. broad at the base, and 3.5 mm. thick at the base. The hollow grinding extends from base to tip and deeper on one side than on the other. The blade is atypic in having no curvature, and cannot have been of much service as a weapon, or for general purposes.

The hilt is 8.5 cm. long and is flattened with a wide extension through which the characteristic hole is made. It is made of hard, brown wood, and has a false ferrule cut out from the wood. The knife has no sheath.

Goepuk. — As it exists in Asahan, this knife is a rather small one. Elsewhere in Sumatra the writer has not been able to see it, nor does Volz mention it. Warneck, however, does list the word as *gupak*, which he translates *hackmesser* and which he says is an Angola word. This suggests a knife larger than the examples in this collection. As seen here, the blade of the *goepuk* has a backward-curved edge. In two of the examples the back, too, is curved, but in the third it is straight in the basal part of the blade and curved in the terminal third to form a scimeter-like point. The form of the blade, as well as its weight, gives one the idea that this is for general purposes rather than an offensive weapon.

No. 20 has a blade 24 cm. long, 3.3 cm. wide in the middle, and 6.5 mm. thick at the base, its thickest portion. It narrows down to join the hilt, but has no distinct tang. It is well shaped and well made and has enough weight at the point to render it useful for light chopping. The hilt is 8.5 cm. long and is carved to represent a parrot with berries or seeds in its beak. There is a rather faintly suggested false ferrule 1.3 cm. wide. A hard, rather light-colored wood was used in making both hilt and sheath.

The sheath consists of a top piece and two side pieces which are mortised into it. There is no bottom piece, but the lower end is closed by the two side pieces. Two braided bands of rattan are fastened around the two side pieces, one near either end. The whole is well shaped and fits the blade well, but the finish is crude.

No. 21 has a blade 15 cm. long, 2.2 cm. wide at the middle, and 4.5 mm. thick at the base. Both edge and back of the blade are curved and the blade tapers so that it is only 8 mm. wide where it joins the hilt. This is 8.5 cm. long, but only 2.5 wide in its widest part, and is flattened in the plane of the blade, so that it has an ellipsoidal cross-section. There is no sheath to this knife, probably because it was not carried, but was used around the house. The blade is of good material and is strong and very rigid.

No. 22 is much lighter and flimsier than No. 20 or No. 21, though the blade is longer than that of No. 20. The blade is 25.5 cm. long, 2.2 cm. wide at the base, and only 3 mm. thick. Both edge and back are curved from tip to hilt. The blade is of native manufacture and laminated. It is uneven in thickness and shows

hammer marks. The temper is so bad that the blade can easily be bent out of shape with the fingers. The hilt is 7.5 cm. long and is curved and flattened. It is ornamented with a design of overlapping leaves emerging from a conventionalized dragon's mouth. There is a false ferrule 2.3 cm. wide. A soft red wood was used for the hilt, which is well designed but poorly executed. The sheath is of the same material and is made in two pieces. On one side is a rectangular boss ornamented with a rectangular design. This boss is perforated to allow the passage of a thong or cord for attaching the sheath to a belt. Three roughly braided rattan bands bind the sheath.

Halasan. — This is a very common knife among the Karo and the Toba Bataks and several examples are figured by Volz. Volz, however, calls the weapon a *kalasan*, a change of one consonant only. The Toba language originally did not contain the *k* sound, though a few words, mostly of Malay origin, that contain this sound, are now included in it. It is natural, then, for the Toba name to be *halasan* and, since the Asahan language is a derivative of the Toba, we find the same name current in Asahan. This type of knife is not a very common one in Asahan, though it may have been more widely used in former, warlike times. It was used not only for fighting but also as a hacking knife to cut lianas and other plant growths from the trail. It is only by the constant use of such knives by travelers that the trails are kept open. For this purpose it has largely been replaced in Asahan by the less aristocratic *parang* of Malayan origin, and since the Asahans no longer carry on wars the *halasan* is not often seen.

No. 23 (Pl. VI) is the only Asahan *halasan* in the collection. It is smaller than most blades of this type. The blade is 41 cm. long, 2.3 wide near the tip, where it is widest, and 6 mm. thick at the base. The tang is 2 cm. long, 1.3 cm. wide and 8 mm. thick where it enters the hilt. The base of the blade has an ornamental guard composed of several teeth. Distinct laminations show in the blade, which is well finished and well tempered.

The hilt, which is 14 cm. long, is round at the point where the blade enters, but flattened at the outer end, which is a typical *Palembang* hilt. There is no ferrule and the hilt has split badly

because it was not bound around the tang. A very hard, dark brown wood is the material of the hilt, which was stained black with some resinous substance.

The sheath is a crude affair made of two pieces of a soft, light wood bound together with two simple bands of rattan. It is noteworthy that the small knives have sheaths with a top piece, or at least an upper end, which has a horizontal extension, usually with some sort of decorative treatment, and sometimes, as in No. 14, a very elaborate and beautiful design. The larger knives, on the contrary, either completely lack this horizontal extension or have only a faint suggestion of it. This is not due to the lack of ornament on the larger sheaths, because, although some of the larger knives have only temporary crude sheaths, others have finely made sheaths like that of No. 25, or sheaths elaborately decorated with silver and copper, like that of No. 26. The reason is that the smaller knives are tucked in a belt, a *slendang*, a long scarf sometimes wrapped around the waist, or the top of the *sarong* already mentioned. The horizontal extension prevents the knife from slipping through the girdle and keeps the hilt within easy reach at all times. It also keeps it in sight, so that the beauty of the weapon can be displayed properly, and many of these knives were carried quite as much for show as for defense.

This evolution of the horizontal extension probably also played a part in the development of the construction of the sheath. The use of the top piece may have been due to this, since the top piece is not seen in any sheath too large to be tucked in a girdle. The extension is very liable to split off if carved across the grain of the long side pieces of the sheath. The introduction of a top piece with the grain running at right angles to the side pieces was a logical development, since only in this way could a durable sheath be made.

The end piece of the sheath is less often seen and appears to be a later development, the purpose of which was to hold the side pieces more securely and to prevent them from splitting.

Nos. 24 and 25, typical examples of the Karo *halasan*, are included here to show different types of guard on the blades.

Hangan. — No. 26 is the only example of the *hangan* which

the writer has seen. In form it is a type of the *klewang* described and figured by Volz. The *klewang* is very widely spread in Sumatra and it seems likely that the *hangan* is identical with it, though No. 26 is considerably smaller than the typical *klewang*. The blade is 43.5 cm. long, 4 cm. wide at the top, and 8 mm. thick at the base. It thins out gradually from base to tip, but narrows in the opposite direction, being widest at the tip. The tip is blunt, with a short round from the back to the edge. Both back and edge are curved throughout their length.

The hilt, which is 12.5 cm. long, is made of a hard, brown wood and carved with a conventional dragon's mouth, *kapala Palembang*. There is a ferrule 2.2 cm. wide made of two pieces of a hollow bone and roughly fastened with two bands of iron wire.

This knife has no sheath, probably because of the clumsiness of a sheath which would take such a long curved blade. These long curved knives either have no sheath or are merely wrapped for carrying in a piece of the leaf sheath of a palm, as Volz showed (2, Vol. 2, Fig. 106). The curved blades, which are long but slender, can be housed in a neat sheath, but the *hangan*, the *klewang*, etc., have a broad blade and a blunt point and so are usually carried in the hand without a sheath.

Simoenoeng. — This is a peculiar knife not like any other seen in Sumatra. Its straight back and curved edge ally it with the Karo *rudus*, but it is a smaller knife, and has a unique tip with a curious backward-curled piece of metal which the *rudus* does not have. Nothing is known of the origin of the name. The blade of No. 27 is 30 cm. long, 4 cm. wide at its greatest expansion near the tip, and 6 cm. thick at the base. It is of rather crude workmanship. The hilt is 15 cm. long, of hard, brown wood and carved with a *kapala Palembang*, slightly hollowed out on the lower side. A false ferrule is formed by two raised rings which are carved out of the wood of the hilt. The hilt is cut off with a slant where it joins the blade, and the rings of the false ferrule parallel the diagonal slant. This type of lower end of hilt is seen in some *klewangs*, but there is no other Asahan knife with such a hilt. There is no sheath on this knife.

Alamang. — This is one of the types of sword of which there

are many in Sumatra. As has been pointed out, the fighting days of the Asahan Bataks are over, and such weapons as these are now rather rare. No. 28 is the only specimen seen by the writer; at least it is the only one he can remember. The blade, which is curved on edge and back, is 55.5 cm. long, 3.8 cm. wide and 6 mm. thick at the base. It is of native manufacture and shows laminations very plainly. It is hollow-ground on each side from the back about halfway to the edge. There is no tang exposed, but the blade keeps full width up to the hilt. It may be seen, however, that the tang, which is thrust into the hilt, is only about half the width of the blade. The hilt is made of a massive piece of buffalo horn now cracked and gnawed by rats. It is 14.5 cm. long and is carved with a *kapala Palembang*, in which the tongue emerging from the dragon's mouth is worked out in a leaf design, with the carving left unfinished. There is a narrow false ferrule consisting of a rounded band carved from the horn. The sheath is a very poor affair made of two pieces of soft wood. It is held together by one braided band of rattan and two plain bands of the same material.

Kris. — The *kris* is the best known over the whole world of any of the weapons of the East Indies, because of the rather frequent references to it in literature, especially that of a somewhat sanguine type in which the *kris* becomes the lethal weapon in the hand of a mysterious assassin. Among the Malays it is common, though in these days it is worn for ornament more than for use. The hilt is almost always carved to represent a seated figure. No. 29 shows this, though the figure is considerably conventionalized. The blade of the *kris* is usually wavy; the larger the number of curves the more desirable the blade, but No. 29 has a straight blade which is by no means uncommon among the Bataks. These people are not nearly so fond of the *kris* as are the Malays. No. 29 is not an Asahan weapon, but is very like some seen in Asahan, and is included to show the type. It probably came from Alas-land.

Podong. — This is the sword or saber, which is very common all over northern Sumatra. It is most likely that this weapon is of European origin, and, in fact, many of the examples seen bear

trade-marks which show that they were made in Europe. Some of the marks, however, are imitations, as Volz has proved. Many of the swords are very handsome and have hilts covered with braided silver wire. Although examples were seen in Asahan the writer was unable to secure any of them. The two figured in this collection were purchased in Brastagi in Karoland and are of unknown origin. No. 33 has a fine blade of excellent steel, which bears no trade-mark, though its quality suggests that it came from Europe. It is 60 cm. long and 2.5 cm. wide at the base, and is hollowed along the back. The hilt is roughly cast from iron, with a guard in the form of a cross and a chalice on the pommel. The chalice has a scalloped leather pad inside and an iron button in the center. In similar specimens the author has seen a tassel, which is attached to this iron button, but this weapon had none when purchased.

No. 34 is a native product beyond any doubt, for it shows the characteristic laminations and is a very poor piece of work in general. The metal is very soft and has little temper, so little that it may be bent permanently with the fingers. The blade is of nearly the same size as that of No. 33, having a length of 57 cm. and a width of 2.8 cm. at the base, and is hollowed only slightly. The hilt is curious in that it is a native imitation of that on No. 33, but it is cast in brass. It is more clumsy than that of No. 33 and is considerably shorter.

No. 34 has no sheath, but No. 33 has one which is well made and well fitted. It is made of soft, brown wood and covered with red cloth, which apparently has been given a number of coats of some sort of black varnish. The varnish has cracked and checked to such an extent that it looks like very old and rotten leather. The tip of the sheath is expanded in an unusual fashion, which suggests to the writer, at least, a Persian influence.

TYPES OF HILTS OF BATAK WEAPONS

The author has spent much time in trying to puzzle out some of the curious hilt types seen on the weapons of the Asahans and other Bataks. Volz has made a good deal of the question whether

the hilts curve away from the edge or toward it, but it has been shown above that the type of blade is what determines the knife's name, not the hilt.

The hilts, however, are more or less standardized for each type of blade, so far as general curvature is concerned, but there is less uniformity in the pattern. Each artisan seems to work out his design as best suits him, though of course there is some restraint due to the nature of the blade for which the hilt is being made, But when one studies a number of these knives one finds that. though there is a great deal of difference in detail, most of the hilt types fall into a few classes. Thus far the writer is able to distinguish two main types of hilt into which nearly all the hilts, not only of the Asahan weapons, but of the other Batak weapons as well, may be fitted. One of these is the *kapala naga* or "dragon's head"; and the other is the *kapala bajan* or "parrot's head." When one has observed a rather large number of knives one finds that certain hilt types, which at first seem to have no relation to the types mentioned here, are really part of a series and become understandable when considered along with others of the series.

The *kapala naga*, or "dragon's head," is very common indeed on many different types of blades. In Plate VII an attempt is made to show the relations of the different knives of the collection which have this type of hilt. No. 1 is an obvious and rather realistic dragon's head carved from bone, with the hollow of the bone forming the opening of the mouth. One must not assume, however, that the mouth has an opening only because the bone was hollow. Volz is led into error in regard to what he calls the "split-grip," which is represented by No. 30 in this series and which is the culmination of one line of development of the dragon's head. It was the idea of Volz that the split in the end of the grip was due to the fact that the buffalo horn is solid only a little distance from the end and hollow for the remainder of its length. Accordingly, the outer end of a knife hilt made from this material is hollow and, if the sides are shaved off to flatten the grip and render it more comfortable to the hand, one gets as a result two spreading extensions with a space between them. This, according to Volz, is the origin of the split-grip.

Now with this much settled, Volz goes on to speculate about the probable age of the split-grip, which he says must be recent, since the buffalo did not exist in the old Malayan culture, but was introduced by the Hindus. Buffalo horn was indispensable in the construction of such a knife and hence the knife could not have been known to the pre-Hindu Malayan culture, but must be a Hindu introduction. No. 10 is a hilt which seems to upset Volz's too finely spun theory, since it has the hollowed mouth of the dragon, not because of the use of a hollow bone or horn but for the very good reason that a dragon's mouth ought to be hollow. The designer has gone to great trouble to make the mouth in that way because wood was used for the hilt and had to be hollowed out to develop the idea. In No. 27, too, there is some hollowing of the hilt, which is also of wood. The writer, therefore, does not agree with Volz here, but feels that Nos. 1, 10 and 30 form a continuous series in the *kapala naga* development.

But there are a number of other variants of the *kapala naga* which are surely related to one another, but not so surely related to the three already discussed. These, to be sure, have the idea of the gaping dragon's mouth, but they differ from the others in the presence of a tongue, which Nos. 1, 10 and 30 do not have. If we begin with No. 23, it is possible to arrange a reasonable series of forms among the others. No. 23 is a type called *kapala Palembang*. This is very suggestive, since the Palembang region was strongly influenced by the Hindu culture, which must have reached the Asahan area in an attenuated form. We may suspect, therefore, that the Palembang hilt is of Hindu origin, and in fact we become very sure of it when we look at it long enough to see in it, as we must in the end, the *makara* of Indian architecture. The *makara* is said to be a sort of dolphin, or a shark, and the Hindu has the *naga* as well. Hence it may be that the *kapala Palembang* is not a *kapala naga*, as Nos. 1, 10 and 30 are. No. 10 cannot be any sort of shark or dolphin because, in addition to the hollow mouth, which has been mentioned, it has the scales of a snake carved on the head and has teeth as well. The scales are very realistic, though they appear to be scales from the body, rather than from the head, but one cannot complain of that, since one

gets a definite notion of a snake, or some snakelike animal, which was doubtless what was intended.

No. 28 also is called a Palembang hilt, and it, too, is a *makara*, but one with a tongue more elaborately carved. Nos. 9 and 22 belong to the same general series with a very simple jaw line, but with a tongue conventionalized into a mass of leaves. The Asahan does not see the Palembang hilt any longer in this, but calls it a *kapala soenggil Serani*, or a "Syrian hair knot." One cannot deny the resemblance, but there can be no reasonable doubt that the series runs as stated above.

No. 11 starts a new line of the Palembang series. The slant of the hilt is different from that of the others, and this makes the whole hilt look different, yet examination reveals the lines of the open mouth and a short, but definite, tongue. There is a jump from No. 23 to No. 11, but these two must be a part of the same general series. From No. 11 it is easy to pass to No. 14, which reveals the lines of the jaw plainly enough. But here the tongue is very highly developed and gives rise to a *boenga hoenik*, or "*hoenik* flower." Though No. 14 manifests a play of imagination in the development of the idea shown in No. 11, in No. 13 we have, on the contrary, a further simplification of the idea, with the result that of itself No. 13 would not be suspected of representing any mythical or other animal. When it is compared with the others of the series there seems little doubt that it belongs with them.

From No. 23 to No. 26 is another leap of considerable magnitude, for the type has undergone notable changes. Yet No. 26 is still recognized as a *kapala Palembang*, which it is beyond doubt. However, the next hilt in the series is given a new name, in spite of the fact that it is more like No. 26 than No. 26 is like No. 23. This No. 27 is a *simoenoeng*, so far as the blade is concerned, and the hilt, too, is called a *kapala simoenoeng*. The principal differences between Nos. 23 and 26 are that No. 26 has the base of the hilt cut on a slant and that the mouth is slightly hollowed out.

Nos. 7 and 8 must be seen in the series for one to understand how they can have any connection with a *kapala naga* or a *kapala Palembang*. One can see in them, however, the main lines shown

in No. 27. Though they are a type in themselves, known as a *kapala toras*, which has definite elements, the number of parts in the design and the general disposition of these parts make it almost certain that Nos. 7 and 8 came from such a form as No. 27.

No. 21 becomes understandable from Nos. 7 and 8. There has been a reduction of parts from those two, but the general idea is still visible. This type is given a special name, *kapala lindoeng*, but what may be the significance of the name is unknown.

The *kapala bajan*, or "parrot's head," is rather more obvious in most of its forms than is the *kapala naga*, but even so it is not always taken for what it really is. On this type, too, Volz made some mistakes, especially when he considered some of the very highly conventionalized types of *kapala bajan* as "knob-hilts." Of course, not every knife with a knob on the end is a *kapala bajan*, but some of the knob-ended hilts are undoubtedly members of this general series.

No. 15 (Pl. VIII) serves well as the beginning of the *kapala bajan* series because it is a realistic representation and there can be no doubt that it represents a bird, and, more definitely, a parrot. The beak, the eye and the crest are all very natural. Some hilts have been seen by the author which have these characters and, in addition, a fine representation of the feathers all over the head, so that the carving becomes almost a portrait of some individual bird. The transition to such a hilt as that of No. 20 is slight, for here again we have a very good likeness and it is only the lack of the eye that makes No. 20 less naturalistic than No. 15.

No. 18 is still readily recognizable, though there has been more conventionalization than in any of the preceding specimens. The beak is hardly more than an ornament, yet the curves are revealing when they are examined in detail. The point is undercut in such a way as to make it plain that this is really a beak. The eye is very much enlarged, not because of the needs of the design as such, but rather because the knife is a *koerambit*, and that knife must have a perforation for the finger. No. 19 is subject to the same necessity and the hole is made larger than in No. 18, with the result that the knife has a more efficient hilt, even though the likeness is less noticeable. Here the beak is

barely suggested, and one would hardly see the slight point developed on the edge side of the hilt if one had not been warned by other knives of this series. No. 19 seems to be the culmination of this line, since little remains to remove if one is still to have a *koerambit* with its perforated hilt. The faintly suggested beak could be removed, and that is all that could be done. No. 17 belongs somewhere in this series, but has no very near affinities among the hilts already discussed, or with others to come into the discussion later. It is called a *kapala toeng-toeng* by the Asahan people, which name may have a special significance, though none was discovered by the writer. It does not seem unreasonable to consider that this, too, is a *kapala bajan*, for the little point on the edge side of the hilt can hardly be anything other than a beak. Volz refers to such knives with a knob-hilt as having a point on the knob, but seems to miss the significance of this point. The thin raised ridge above the point may represent the crest of the bird, but this cannot be asserted with confidence.

From No. 20 one passes easily to No. 25, for the changes are not great; there is a little more curve of the hilt, so that the beak becomes turned under. In this the eye is shown by an ornamental boss of the copper, which the Karo Bataks are fond of using. This knife as well as the next two of the series is a Karo knife.

No. 24 is the next in this set and shows a further turning under of the beak. The eye, too, has disappeared from the hilt and the likeness to a head of a bird has been considerably diminished. A hilt almost exactly like that of No. 24 is figured by Volz as a knob-grip, and he seems not to have sensed the *kapala bajan* in it at all.

In No. 31 we have a highly conventional treatment of a hilt. At first glance it is almost exactly what one would expect to develop as an outcome of an attempt to make a simple curved hilt. But such a treatment will not account for the line on the under, or edge, side of the hilt. This line, or rather, ridge, has a reverse curve under it and requires only a glance to be recognized as the beak of the *bajan*, which we already have in several forms. Whether this is the culmination of the line or whether No. 12 is a further development is not certain. The writer is inclined to think

that it is a further development of the same idea, but it may be hard to convince others of the correctness of this assumption. Most of these hilt designs are not the result of chance, as has been shown, and this particular one could very well have come from the extension of the series which has just been discussed.

No. 32 does not belong in the *kapala bajan* series, but is put in here because it shows another type of bird's head, namely, a cock's head. This is not an Asahan knife, but was bought from a peddler and is under some suspicion of having been made for sale to tourists. Yet it, too, in all probability, had a definite precedent for its type, and it serves to show that such a head might be the origin of another whole series of hilt designs.

RELATIONSHIPS OF THE WEAPONS

It has been necessary to draw on a large field to secure the different series of hilt types to illustrate the origin of the various designs. In spite of this, the author believes that the types of a series are all related, though some have become so fully conventionalized that their origin is not suspected by the makers of the knives. The different forms are coexistent, so that the progress of conventionalization is not a matter of time, or stage of civilization, but is probably a matter of the craftsmanship and art sense of the individual. Without trying to lay down any rule concerning the manner of development of design among primitive peoples in general, the author wishes to record his idea of the growth of design among the Asahan Bataks. Here it seems that the most primitive-minded individuals aim at a realistic rendering of natural objects particularly animals. The execution of the idea may be crude, as it usually is, or may be very good. With an increase in taste there seems to be a tendency to insist less on a portrait of the object than to suggest the object represented, and then to add some extraneous ornament. Those individuals who have taste of a very high type carry on the conventionalization to a degree still higher, and introduce the graceful leaf designs which are so well used on some of these Asahan weapons. These designs are out of the range of the ability of the primitive-minded individuals, both in concept

and in execution, yet both these classes of workers may be making knives at the same time. After the skilled designer has worked out a conventionalization of an animal, a less skilled worker may copy it with the omission of some of the delicate and beautiful ornament, so that one who comes across his work later on may say: "Here are crudity and conventionalization combined; here is a primitive conception of art." The writer is convinced that this is not true for the Asahan people, whom he has observed over a considerable period of time. The crude concept seems always to be a realistic one, however poorly the object may be imitated.

The designs of the sheaths seem to show a resemblance to only one of the hilt designs, namely, the *kapala naga*. It may be carrying the idea too far to see the resemblance in them, but it does not seem so to the writer, who has spent much time in examining the specimens and in attempting to find reasonable explanations of them. Mention has already been made of the horizontal boss which is formed on the upper end of the sheath so as to keep the knife from slipping through the belt or girdle. It is this part of the sheath which is most commonly ornamented in Asahan knives, although Karo and Toba sheaths may have elaborate ornaments of silver and copper at the lower end of the sheath and numerous bands throughout the length of the sheath.

In No. 15 (Pl. IX) there is a definite set of lines which suggest the opening of the dragon's mouth, from which a rounded mass of wood emerges which may be taken to represent the tongue. This is, then, a *kapala Palembang* or *makara* type. In No. 22 the same thing is seen, but the sheath ornament is almost an exact duplicate of the hilt design, and that design has already been explained as a *kapala naga*, although called a *soenggil Serani* by the natives, who have lost the idea of the dragon's mouth because of the conventionalization. In No. 10 there is only a slight suggestion of the mouth, and the leafy scroll which emerges from it is not at all suggestive of a tongue. It is slightly closer, however, to the original type than the one which seems to follow it in the series. In the latter example, No. 8, there is no longer any mark which indicates even vaguely the dragon's mouth. Otherwise it is very like No. 10.

If we pass to No. 7, we find a sheath ornamented, if one may call it that, by a plain area or boss of a sort of shield shape which is raised above the remainder of the sheath, but is otherwise not distinguished from it. It is conceivable that this design may have been derived from one such as is seen in Nos. 8 and 9. The latter has not been mentioned before, but it is almost identical with No. 8, except that it is of much finer workmanship.

Another series may be traced from No. 22 through No. 16, which shows a decided peculiarity in that the whole upper end of the sheath emerges from the mouth, instead of only the horizontal boss, as in most of the others. No. 13, which comes next in the series, is much the same, but here there is a line on only one side to suggest the opening of the mouth and nothing at all on the other side.

No. 18 may be an offshoot of this idea, but one can hardly be positive of it, and No. 32, with its elaborate scrolls, may be only a development of the type in No. 18.

No. 20 has strong resemblances to No. 13 in the little toothlike projections on the outer and upper part of the sheath. Nos. 2 and 4 seem to be a simplification of this design.

In No. 11, however, the undoubted simplification takes a form different from that shown in Nos. 2 and 4, and the projecting part becomes greatly elongated. We may pass from this to No. 17, which has a horizontal extension of as simple a type as could be found anywhere. Nos. 5 and 6 may represent a further simplification from No. 11, but on the other hand they may belong to a series totally different.

No. 14, with its magnificent carving, seems to be an elaboration of such a form as that seen in No. 22. It evidently does not belong in the longer series, but is rather the high point in the development of that particular idea.

OTHER WEAPONS

The blowpipe, or *soempitan*, is not very common anywhere in Sumatra in these days, and is very rare in Asahan. The writer was able to see two or three examples, but was unable to secure one, although he was always hopeful that some of the promises to

procure one for him would be fulfilled. The inside tube of the *soempitan* is made from a species of bamboo found in Asahan which has very long internodes. The inner tube is supported by an outer tube made of a larger bamboo, or a piece of palm trunk, split and fitted around the inner tube to which it is cemented by some resin or gum. The darts are fashioned from pieces of the midrib of palm leaves and are usually made with a point so cut as to break off in the wound. They are carried in a quiver of bamboo, with their poisoned tips down, so that they may not scratch the user. The kind of poison used has not been investigated by the writer. The base of the dart is wrapped with a bit of *kapok*, and the dart is slid into the tube, which it fits loosely. To one who has never before seen a blowpipe used, the time which elapses between the beginning of the blowing and the exit of the dart seems very long. The flight of the dart, however, is very swift and true. In spite of the decline in its use one realizes that the blowgun is no mean weapon.

Very old smooth-bore muskets are fairly numerous, but they are held at a rather high price because in Sumatra natives are not allowed to buy firearms, and they naturally prefer the crude old ones to none at all. Nearly all the muskets have old Spanish dollars sunk into the stocks, further evidence of their age, although why such an expensive mode of ornamentation is used is not clear. The coins could be beaten out into plates and used much more effectively, but this is not the custom. The Achinese make, or used to make, brass cannon of all sizes, but no weapons of this kind were ever seen in Asahan and it does not appear that the Asahan artisans ever developed the skill to make them.

The only other Asahan weapon of importance is the spear, or *toembuk*, which is quite common and which has been used in the past for fighting. At present, it is used to kill tigers and wild pigs, and is carried also as an ornamental staff and as a symbol. Two specimens are included in this collection: one, No. 35, is an ornamental affair and the other, No. 36, is an effective weapon which has slain its share of pigs. No. 35 has a blade 27.5 cm. long and 2.2 cm. wide, made of native steel which shows many laminae. It is rather thin and not well tempered. The tang has four orna-

mental rings and is thrust into a shaft of hard, red wood. The shaft is bound around the tang by a silver ferrule, 12 cm. wide, which is finely decorated with a design of leaves spiraling between bands which are incised with semicircles to suggest the coils of a serpent. There are two rings at each end of the ferrule between which a design of triangles bearing spreading rays like a sun is engraved. A perforated disk of silver is fitted between the ferrule and the blade, and this also bears the triangular design on its upper surface. The shaft is 128 cm. long and 2 cm. in diameter, and has on the end a counterpoise 14.5 cm. long, carved from the round.

No. 36 is much heavier than No. 35. Its blade is 29.5 cm. long and 4 cm. wide. Four rings on the tang take up a space of 2.5 cm. above the ferrule, which is of brass and which is 1.5 cm. wide. The shaft, which is made of a very stiff and strong rattan stem, is 105 cm. long and 2.5 cm. in diameter; there is no counterpoise. No. 35 has no sheath, but No. 36 has a sheath made of two pieces of soft wood held together by two bands of rattan.

In this paper it has been the purpose of the writer to give a description of a collection of the weapons of the Bataks of Asahan, a little-known tribe of the East Coast of Sumatra, and to make some observations on the possible origin of designs of hilts and sheaths of Batak knives.

University of Michigan

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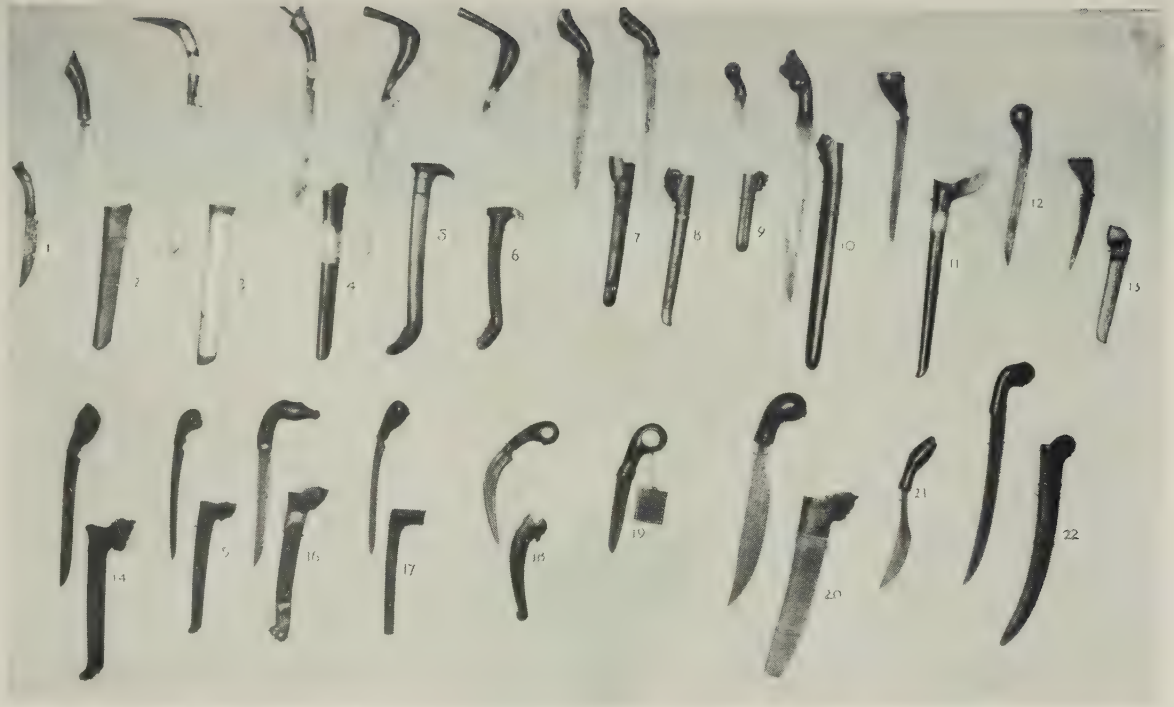
3. Warneck, J. 1906. Tobabataksch-deutsches Wörterbuch, Vol. 1, 252 pages. Landsdrukkerij, Batavia.

EXPLANATION OF PLATES

Unless a statement to the contrary has been made in the text all the weapons illustrated are authentic Asahan specimens. All are in the author's collection.



Types of knives and hilts. Names of knives are given first and those of hilts follow: 1, raut, naga; 2, raut, boenga kiambing; 3, tordjong, hinata; 4, tordjong, hinata; 5, rendjong, rendjong; 6, rendjong, rendjong; 7, badik, toras; 8, badik, toras; 9, badik, soenggil Serani; 10, badik, kapala naga; 11, bolado, toras; 12, bolado, boenga poning; 13, bolado, toras gading; 14, toembuk lada, boenga hoenik; 15, toembuk lada, kapala bajan; 16, golok, golok; 17, golok, toeng-toeng; 18, koerambit, kapala bajan; 19, koerambit, kapala bajan; 20, goepuk, kapala bajan; 21, goepuk peragit, lindoeng; 22, goepuk, soenggil Serani

Types of weapons. Names of knives are given first and those of hilts follow: 23, halasan, kapala Palembang; 24, halasan, kapala Palembang; 25, halasan, kapala bajan; 26, hangan, kapala Palembang; 27, simoenoeng, simoenoeng; 28, alamang, kapala Palembang; 29, kris, buaja domum; 30, sikin, kapala naga; 31, samaremu, kapala bajan; 32, rendjong, kapala manoek; 33, podong; 34, podong; 35, toembuk; 36, toembuk

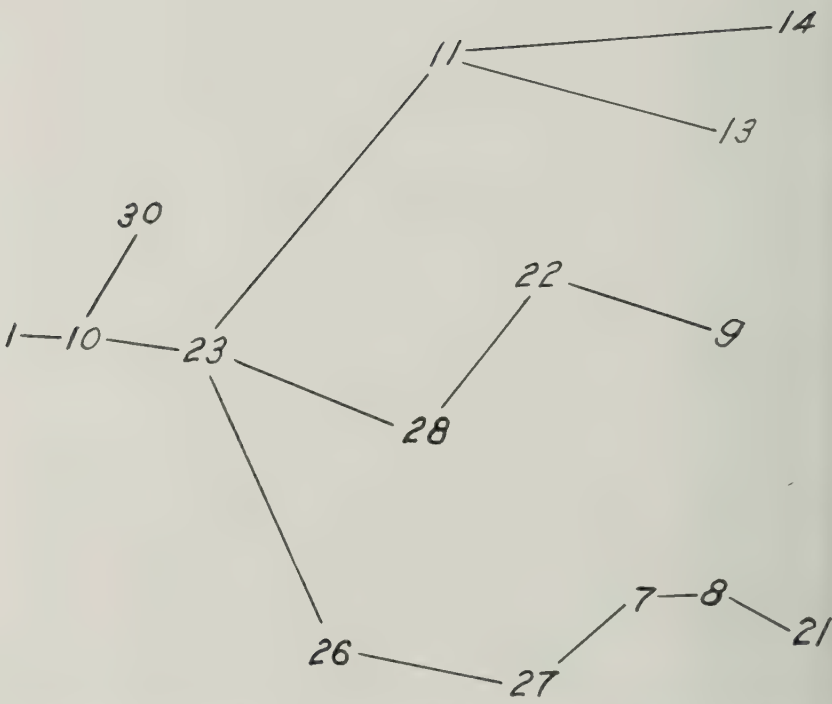


Diagram of the development of the *kapala naga* and *kapala Palembang* hilt designs in Plate VII, showing the relations of the different series. See text for explanation

PLATE VII

Kapala naga and *kapala Palembang* hilt designs

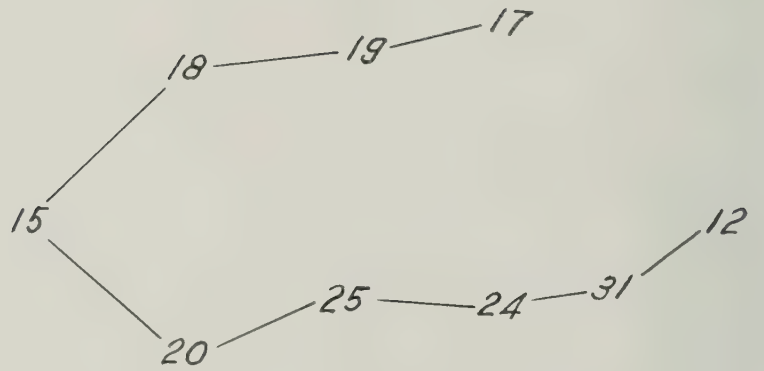


Diagram of the development of the *kapala bajan* hilt designs in Plate VIII, showing the relations of the different series. See text for explanation

PLATE VIII

Kapala bajan hilt designs

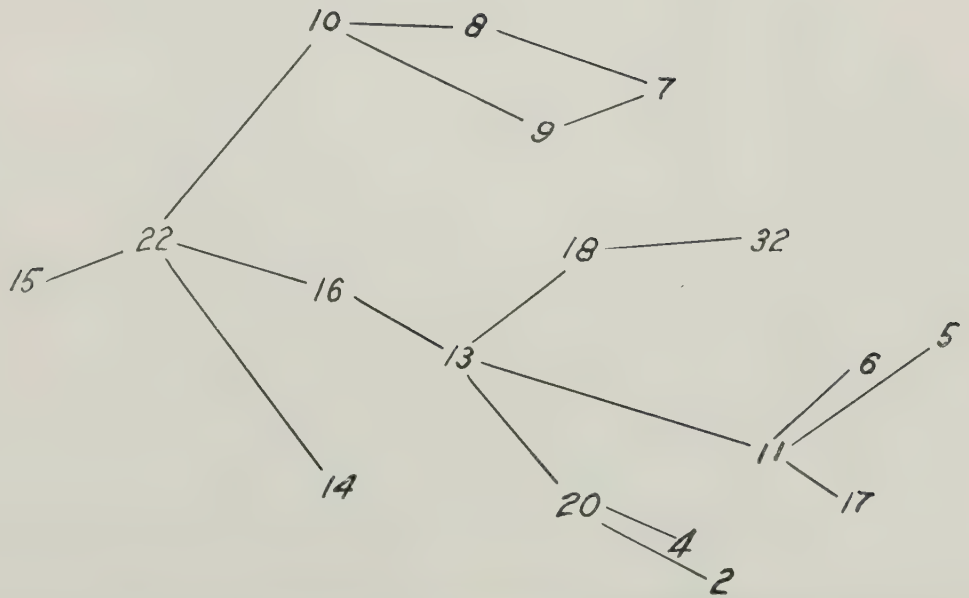


Diagram of the development of the *kapala naga* motif in sheath designs in Plate IX, showing the relationship of the different forms. See text for explanation

The *kapala naga* motif in sheath designs

FOLKLORE HEIRLOOMS *

EUGENE S. McCARTNEY

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MOST of the countless items of folklore that are still available for collection and study are ours by inheritance. We are the legatees of the ages. Just as these "old curiosity shops," our bodies, contain many vestigial remains from a hoary past, so the contemporary corpus of superstition preserves numerous records from a remote antiquity.

In the channel of modern life superstition is making obstinate resistance to the encroachments of science, for it is fighting for its birthright, complete possession of the channel. This figurative channel may be compared to an actual one in Switzerland in which waters from glaciers and waters from lower sources race side by

* The books listed in this note will be referred to by names of authors only:

Bergen, F. D., *Current Superstitions. Memoirs of the American Folk-Lore Society*, Vol. 4, 1896.

Cox, M. R., *An Introduction to Folk-Lore.* D. Nutt, London, 1895.

Elworthy, F. T., *The Evil Eye.* John Murray, London, 1895.

Gregor, W., *Notes on the Folk-Lore of the North-East of Scotland. Publications of the Folk-Lore Society*, Vol. 7, 1881.

Halliday, W. R., *Greek and Roman Folklore*, Vol. 44 in *Our Debt to Greece and Rome.* Longmans, Green and Co., New York, 1927.

Harland, J., and Wilkinson, T. T., *Lancashire Folk-Lore.* John Heywood, London, 1882.

side for a considerable distance, with their contrasting colors indicating how much of the channel each occupies.

In prehistoric times, however, the stream of superstition had undisputed possession of the entire channel. Eclipses, comets, thunder, earthquakes and all violent and unusual manifestations of nature aroused alarm in man.[1] Even in the enlightened periods of classical antiquity there were doubtless thousands of persons who were superstitious all day long, whether rising or dining,[2] farming [3] or fishing, staying indoors or going a journey, saying prayers or mumbling incantations. In fact, Theophrastus has left for us in "The Superstitious Man" examples of the terrors that might face a man throughout the livelong day.

Into the stream of superstition, which originally had no rivalry, finally a few drops of clear water began to trickle and gradually to increase in volume and make their presence felt. We find the Greeks and Romans expressing gratitude to the men who freed them from this or that superstition and marveling at their genius,[4]

Henderson, W., *Notes on the Folk-Lore of the Northern Counties of England and the Borders. Publications of the Folk-Lore Society*, Vol. 2, 1879.

Maclagan, R. C., *Evil Eye in the Western Highlands.* D. Nutt, London, 1902.

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[1] Cf. Ovid, *Met.* 1.55: "humanas motura tonitrua mentes." We are told by Suetonius, *Tib.* 69 (cf. Pliny 15.135), that Tiberius was unreasonably afraid of thunder ("tonitrus praeter modum expavescebat") and that, when the heavens were overcast, he never failed to wear a laurel garland on his head, because it was a general belief that laurel was not struck by lightning.

[2] For some ancient table superstitions see Pliny 28.26–27.

[3] See Tavenner, E., "The Roman Farmer and the Moon," *Trans. and Proc. of Am. Phil. Assn.*, 49 (1918) : 67–82. It is interesting to compare with this article one that gives some superstitions about the moon collected in central Pennsylvania by Owens, F. G., *Journ. of Am. Folk-Lore*, 4 (1891) : 119–120.

[4] See, for example, Seneca, *Nat. Quaest.* 6.5.2; Pliny 2.54; Lucretius 1.62–71; Verg., *Georg.* 2.490–492.

but the revelation that a few things in nature had a rational explanation did not quickly lead people to infer that all had.[5]

Against ignorance and opposition the stream of science widened and deepened its part of the channel and, like the glacier stream in Switzerland, kept its own waters pure. In Greek and Roman times it began to usurp much of the channel that belonged to superstition, but lost its gains during the Middle Ages. With the advent of the Renaissance it again started to fight for a larger share of the channel, and has been continuing the struggle ever since, but science and superstition are still running side by side.

Though science is slowly narrowing the part of the channel defended by superstition, the struggle for full possession will be long. Almost four thousand superstitions have been collected from one state in our nation.[6] There is no reason to think that a like number of beliefs could not be gathered in every state. Some of them are amusing and harmless; some contain menaces to society, especially those that oppose medical and sanitary science.[7] Those of the midwives are, perhaps, the most devastating in their results.[8] It is clear, therefore, that superstitions and popular beliefs are not back eddies in the stream of progress. They are part of a main stream.

[5] See Polyb. 36.17.1–4 (6 : 382–383, in the Loeb Classical Library edition). Polybius is open-minded and discerning. "He thinks that natural phenomena for which a logical reason can be found should not be ascribed to the action of the gods, but he took the course of least resistance in leaving a field of activity for the gods in things which it was difficult or impossible for a human being to understand. Plagues, unusually heavy and long-continued rains and snows, and severe frost and drought might rightly, perhaps, be attributed to the agency of the gods." This summary is from a paper of my own in Volume XIV, page 161, of this publication.

[6] See Thomas, D. L. and L. B., *Kentucky Superstitions.*

[7] Examples of such superstitions have been collected by Morgan, J. D., "The Combat of Scientific Medicine with Superstition," *Washington Medical Annals,* 5 (1907) : 325–327; Pettigrew, T. J., *On Superstitions Connected with the History and Practice of Medicine and Surgery* (Barrington and Haswell, Phila., 1844); Haggard, H. W., *Devils, Drugs, and Doctors* (Harper and Bros., New York and London, 1929); Spicer, G. S., "Health Superstitions of the Italian Immigrant," *Hygeia,* 4 (1926) : 266–269; Neustätter, O., "Ghosts and Gods, Astrologers and Miracle Men," *Hygeia,* 9 (1931) : 518–523.

[8] Titus, P., "Obstetrical Superstitions," *Pennsylvania Medical Journal,* 21 (1918) : 478–480.

In this paper I shall give examples of beliefs and superstitions and try to show that they existed in Graeco-Roman times. I shall not often stop to present intermediate material that may be available. I should not like, however, to convey the impression that all beliefs which I cite go back to Greeks and Romans to the exclusion of other branches of the Indo-European peoples. It is because we have so much classical literature that I am making Greeks and Romans representatives of our Indo-European ancestors. Doubtless some of our superstitions have come to us from the Roman occupation of Britain.[9]

It is true that parallels to a few superstitions that I shall mention may be found in Asia and Africa and elsewhere, but it is fairly safe to say that most contemporary popular lore which existed in antiquity has taken the direct and normal route in reaching us. I doubt not, however, that I shall list two or three modern superstitions that may merely resemble ancient ones instead of being legacies from the distant past.

We say that it is a sign of rain when the swallow flies low. The literary tradition for this item of folklore can be traced back through old New England almanacs and English books on husbandry to Vergil, who got it from Aratus,[10] who may possibly have taken it from a collection of weather signs which has been ascribed to Theophrastus and which records hoary popular beliefs. The Japanese have the same saying,[11] and doubtless it can be found among other peoples. In every country where there are swallows they follow the insects when they are driven to lower levels by heavy atmosphere. Even if we could not fill in the intermediate stages I think we might safely assume that we inherited this piece of lore from our Indo-European ancestors.

My paper has to do with the unnatural and supernatural things with which popular imagination has invested the life of a human being from babyhood to spirithood, except for the period

[9] For an example see page 135.

[10] Perhaps this item of weather lore was ancient in Italy when Vergil wrote, but he includes it in a large number of weather signs which he takes from Aratus.

[11] See Fegen, W. C., "Japanese Weather Wisdom," *Trans-Pacific*, 16 (1928) : 6.

of middle life, for which I have found but few specific superstitions. Between the sections of my paper that deal with beliefs associated with early life and those concerning death I shall introduce a number that apply to life in general.

Superstitions itemized in books of folklore, with numbers before them, seem rather detached from actual life. They become more real when one finds them in literary settings. For this reason I have quoted freely from novels in which popular lore is used to give local color and from many masterpieces of other forms of literature. As one might expect, almost all Greek and Roman writers preserve at least a few items of folklore.

PART I: INFANCY AND CHILDHOOD

WHERE BABIES COME FROM

Children ask where their baby brothers and sisters come from. In England and parts of our own country babies are found in cabbage patches and parsley beds.[12] In Virginia Moore's novel, *Rising Wind*,[13] there occurs this sentence: "You, sir, weren't born under a cabbage leaf." Among the real and imaginary experiences related by Miss Joan Lowell in *The Cradle of the Deep* [14] there are not included any falsehoods about the origin of human life. "I often wondered," she writes, "where children came from, and in reply to my queries the sailors gave me no stork fable or yarn about being found in a cabbage patch."

In E. S. Hartland's *Primitive Paternity* [15] there are many examples of the answers given to inquisitive children. They are told that babies come from trees, fruits, vegetables and plants in general. Among the trees mentioned in this connection are the beech, the lime, the oak and the ash.

Hesiod [16] tells us that man sprang from the ash. In the

[12] *Journ. of Am. Folklore*, 40 (1927) : 150, No. 11; Hartland, E. S., *Primitive Paternity* (D. Nutt, London, 1909–10), 1 : 41, *et passim*. See also Wuttke, pp. 26, 28.

[13] P. 7 (E. P. Dutton & Co., New York, 1928).

[14] P. 77 (Simon and Schuster, New York, 1929).

[15] 1 : 41–43.

[16] *Works and Days* 145.

Aeneid [17] Vergil says that mankind came from the trunks of trees, and mentions the oak. This tradition was firmly established in Homeric days, for occasion is taken in the *Odyssey* [18] to deny its accuracy. Much similar material that attributes the origin of man to earth, to water, to earth and water mixed, and even to stones, may be found in classical writers.[19]

The modern stories which say that children come from beds of cabbage and parsley are rather closely paralleled by the Athenian legend that man originally grew out of the earth like cabbage,[20] and also by the statement of Empedocles [21] that children were born from the earth like spinach.

The explanations given to modern children are of the same character as the serious theories proposed some two or three thousand years nearer to the childhood of the race to account for the origin of man. It would seem that they are a part of our Indo-European heritage, and that, with a slightly different application, they were relegated to children when adults had outgrown them.[22]

BONDS AND KNOTS AS HINDRANCES TO CHILDBIRTH

There are many superstitions connected with the ushering of children into the world. In *The Bridge of San Luis Rey* [23] the marquesa, on learning that her daughter was to become a mother, "practiced a degrading system of taboos for her child's protection. She refused to allow a knot in the house. The maids were forbidden to tie up their hair and she concealed upon her person ridiculous symbols of a happy delivery."

Thornton Wilder is sound in his folklore. He might have gone a step farther and have had the marquesa open all doors and

[17] 8.315: "Gensque virum truncis et duro robore nata." Cf. Juv. 6.12.

[18] 19.163.

[19] Examples have been collected by Bouché-Leclercq, L. T. A., *Placita Graecorum de Origine Generis Humani* (Paris, 1871).

[20] Lucian, *Philops.* 3.

[21] Quoted from Varro by Nonius, p. 550 (W. M. Lindsay's edition).

[22] I have taken the material of the last four paragraphs from an article by myself, "*Unde Hominum Genus*," *Class. Journ.*, 20 (1925) : 367–368.

[23] Pp. 69–70 (A. & C. Boni, New York, 1928).

cupboards [24] and even remove from the walls of the house all vines with tendrils. A volume nearly a century and a half old states that "in Persia, when a birth was imminent, the schoolmasters were asked to give liberty to the boys, whilst the birds in cages were allowed to escape." [25]

On reading the passage quoted from Thornton Wilder a classical scholar at once thinks of the case of Alcmena, who, because Juno Lucina had crossed her right knee over her left and had interlocked her fingers, had to labor for seven days and seven nights before the birth of Heracles.[26] Roman women unbound their hair when they prayed to Juno Lucina to ease the pangs of childbirth.[27] "Loosener of the girdle" (Λυσίζωνος) was an epithet applied to Artemis [28] and Eileithyia [29] in their functions as aides to women in travail. It was a Roman custom to give keys to women as an omen of an easy delivery.[30]

It may be noted in passing that the crossing of fingers or hands is still regarded as an impediment to birth in Italy [31] and some other countries.[32]

Superstitions of binding and loosening have a wide vogue and may be found in great numbers in the folklore of many countries.[33] We ourselves at times cross fingers in mock serious-

[24] See, for example, Hastings, J., *Encyclopaedia of Religion and Ethics*, 2 : 638.

[25] Lettsom, J. C., *History of the Origin of Medicine* (London, 1778), p. 48, note, as quoted in Hastings, *op. cit.*, 7 : 750.

[26] Ovid, *Met.* 9.289–316: cf. Pliny 28.59; Ant. Lib. 29.

[27] Ovid, *Fasti* 3.255–258: cf. Pliny 28.42.

[28] *Orphic Hymns*, No. 36, line 5 (p. 78 of E. Abel's edition).

[29] Theocr. 17.60.

[30] Festus, p. 49 (W. M. Lindsay's edition): "Clavim consuetudo erat mulieribus donare ob significandam partus facilitatem."

[31] Jorio, Andrea de, *La Mimica degli Antichi* (Naples, 1832), p. 203; Crane, T. F., *Italian Popular Tales* (Houghton, Mifflin and Co., New York, 1885), p. 6.

[32] Frazer, J. G., *Taboo and the Perils of the Soul* (Macmillan and Co., London, 1919), pp. 294–299; Dalyell, J. G., *The Darker Superstitions of Scotland* (Glasgow, 1835), pp. 302–303.

[33] An important reference is Eitrem, S., "Der Rundgang," *Opferritus und Voropfer der Griechen und Römer* (Christiania, 1915), pp. 6–75. I have given a rather pretentious list of references in *Class. Phil.*, 26 (1931) : 166, in an article in which I used for other purposes material in this section of my paper.

ness. It is done playfully during games when one contestant does not wish his opponent's shot or move to succeed.[34] We say things with our fingers crossed and under such circumstances even a lie does not count against us.[35] It is thought unlucky "to cross knives accidentally at meal times." [36] Tying a knot in a dress or skirt will stop an owl from hooting.[37]

Crossing things should enable one to banish afflictions, but in *Black April* [38] a Negress has to cross sticks twenty times before she gets rid of a toothache. In West Sussex an "old woman said she couldn't no way understand her rheumatis being so uncommon bad, for she had put her shoes in the form of a cross every night by the side of her bed, ever since she felt the first twinge." [39]

Acts of crossing might have national significance, for in councils of Roman generals and other persons of authority the throwing of one leg over the other was regarded as an impediment to all business.[40]

The logic of these beliefs is perfectly clear. Knots and bonds and all things that suggest tying hamper and prevent action by natural and supernatural forces and beings; loosening and unbinding remove hindrances, literal and figurative.

Are not we ourselves good linguistic magicians when we use such expressions as "the tie that binds," "tying the knot" (of marriage), "binding the bargain," "binding to keep the peace," "giving bond," "tying the score," "knotting the count," "putting under obligation" and "imposing restrictions"?

[34] Cf. Bergen, p. 30, No. 91: "At croquet, if your ball was about to be sent flying, the safeguard was to draw an imaginary X with your mallet, saying, 'Criss cross.' It made your enemy's foot slip, and many a girl would get 'mad' and not play, if you did it often."

[35] *Journ. of Am. Folk-Lore*, 36 (1923) : 9, No. 116. On crossing out the rainbow see *Denham Tracts* (*Publications of the Folk-Lore Society*, Vol. 35), 2 : 58.

[36] *The Gentleman's Magazine*, 44 (1855) : 385. Cf. Gay, John, *Farmer's Wife and the Raven*, Fable 37:

"My knife and fork were laid across,
On Friday, too! the day I dread."

[37] Thomas and Thomas, p. 268, No. 3622.

[38] P. 87 (as cited in note 44).

[39] *Folk-Lore Record*, 1 (1878) : 39.

[40] Pliny 28.59.

CAULS

Children who are born with cauls [41] over their faces are possessed of second sight [42] and, whether it is to their advantage or not, can see ghosts.[43] In a popular novel of Negro life [44] a grandfather cannot believe the goods news that "Dis chile was born wid a caul on e face!"

Laughing with pleasure Maum Hannah and Granny both told him again. His grandson had been blessed with second sight. He had been born on the small of the moon and with a caul over his face. He would have second sight. He'd always be able to see things that stay hidden from other people. Hants and spirits and plat-eyes and ghosts. Things to come and things long gone would all walk clear before him. They couldn't hide from this child's eyes.

Good luck attended such children.[45] Perhaps this is nowhere better illustrated than in the German tale of "Der Teufel mit den drei goldenen Haaren." [46] In this story a child is put into a box and thrown into water, but escapes drowning. It grows up and, after several adventures with the devil, finally marries a princess.[47]

In Ben Jonson's *The Alchemist* [48] ability to win at cards is attributed to Dapper because, as his friends explain to him, "Yo' were borne with a caule o' your head." Persons not lucky enough

[41] Other names are *hallihoo*, "holy or fortunate hood" (Henderson, p. 22) and *sely how* (Hazlitt, *s.v.* "Caul," in work cited in note 50). German names are *Glückshaut* and *Glückshaube*.

[42] Thomas and Thomas, p. 10, No. 12: "A child born with a caul, that is, with the birth membranes unruptured, will have second sight."

[43] Bergen, F. D., *Animal and Plant Lore* (*Memoirs of the American Folk-Lore Society*, Vol. 7), p. 22, No. 125: "It is a common belief that those born with a caul over the face can see ghosts."

[44] Peterkin, Julia, *Black April* (Grosset & Dunlap; Copyright by the Bobbs-Merrill Co., Indianapolis, 1927), p. 26. See also pp. 29, 31 and 39.

[45] Bergen, p. 22, No. 15: "A baby born with a veil over its face has good luck."

[46] In the *Kinder- und Hausmärchen* of the Grimm brothers.

[47] In the German folk tale of "Hans im Glück" (in the *Kinder- und Hausmärchen* of the Grimm brothers) the mock-hero remarks: "Ich muss in einer Glückshaut geboren sein." A somewhat similar hero, Gil Blas, has the following words addressed to him as a captive in a den of robbers: "Eh bien! Gil Blas, . . . puisque tu n'as quitté ta patrie pour chercher quelque bon poste, il faut que tu sois né coiffé, pour être tombé entre nos mains." Le Sage, *Gil Blas*, Book I, Chap. 4. In France *être né coiffé* is proverbial for prosperity and good fortune.

[48] I.ii.

to be born with cauls might buy them. Dickens puts these words into the mouth of his other ego, David Copperfield:[49] "I was born with a caul, which was advertised for sale, in the newspapers, at the low price of fifteen guineas."

Large sums were paid for cauls.[50] The bidders were chiefly sailors, since they believed cauls to be insurance against drowning.[51] The seaman's belief in the protective power of the caul has been used in a characteristic way by Thomas Hood in *The Sea-Spell*, parts of which I quote:

> It was a jolly mariner!
> The tallest man of three, —
> He loosed his sail against the wind,
> And turned his boat to sea:
> The ink-black sky told every eye,
> A storm was soon to be!
>
> But still that jolly mariner
> Took in no reef at all,
> For, in his pouch, confidingly,
> He wore a baby's caul. . . .
>
> . . . . . .
>
> Nor rushing wind, nor gushing wave,
> That boatman could alarm,
> But still he stood away to sea,
> And trusted in his charm;

---

[49] *David Copperfield*, Chap. 1.

[50] For prices paid for cauls see Henderson, p. 22: "Twenty guineas were asked for one in 1779, twelve pounds in 1813, six guineas in 1848." See also Hazlitt, W. C., *Faiths and Folklore* . . . (Reeves & Turner, London, 1905), *s.v.* "Caul." A friend of mine attended a woman in Ohio who gave birth to an infant with a caul. The father said it was worth $25. The parents preserved it in alcohol with the intention of sending it back to their native land, England, to be sold to a sea captain.

[51] Cf. Bergen, p. 22, No. 16: "A child born with a veil over its face will never be drowned. Many sailors are known to wear the caul, with which they were born, about the person as a charm against death by drowning."

Many superstitions about cauls have been collected by Ploss, H., *Das Kind in Brauch und Sitte der Völker*[3] (Leipzig, 1911–12), 1 : 54–56. See also Gregor, p. 25; Abbott, G. F., *Macedonian Folklore* (University Press, Cambridge, 1903), p. 139; Rappoport, A. S., *Superstitions of Sailors* (S. Paul & Co., London, 1928), p. 264. For medieval comments on the caul see Levinus Lemnius, *De Miraculis Occultis Naturae* (1593), Book II, Chap. 8. I was able to consult this book through the courtesy of the John Crerar Library of Chicago.

He thought by purchase he was safe,
And arm'd against all harm!
. . . . . .
The ensuing wave with horrid foam,
Rush'd o'er and cover'd all, —
The jolly boatman's drowning scream
Was smother'd by the squall, —
Heaven never heard his cry, nor did
The ocean heed his *caul.*

Seamen have had some competition in getting cauls, for advocates in England,[52] Germany [53] and Denmark [54] have acquired them in hopes of winning their cases. Lawyers were equally credulous in antiquity, since Roman midwives had no trouble in selling cauls to them.[55]

There is a current belief that, if the caul is lost or destroyed, the child will pine away or die.[56] In antiquity, too, such growths were regarded as protections to children. This was one of the many superstitions against which St. Chrysostom inveighed.[57] He likewise assailed a superstitious preacher who thought his professional welfare depended on possession of a caul.[58]

It may be seen, therefore, that several modern superstitions about the caul had roots in antiquity.

TREES AS LIFE-TOKENS

Among the things upon which in both modern and ancient lore the welfare and even the lives of infants have been dependent are trees. "In some districts of Belgium it is still the custom to plant a tree in the garden on the birth of a child. It is thought

[52] Frazer, J. G., *The Magic Art and the Evolution of Kings* (Macmillan and Co., London, 1917), 1 : 199.

[53] Wuttke, p. 381: cf. pp. 406, 454.

[54] Ploss, as cited in note 51, 1 : 54.

[55] Ael. Lamprid., *Anton. Diad.* 4.2: "Solent deinde pueri pilleo insigniri naturali quod obstetrices rapiunt et advocatis credulis vendunt si quidem causidici hoc iuvari dicuntur."

[56] Henderson, p. 22.

[57] *In Epist. I ad Cor. Homil. XII* (Migne, *Patrol. Graec.*, Vol. 61, Cols. 105–106).

[58] For this item I am dependent upon Hazlitt, as cited in note 50, who, however, does not give a specific reference, although he is very circumstantial.

that the fate of the tree is intimately connected with the fate of the child." [59]

Many families in Great Britain, France, Germany, Italy, and other countries retain the custom of planting a young tree for good luck when a child, particularly an heir, is born. This tree grows with the child, and as its destiny is to increase and to multiply itself, so a similar destiny is desired for the child. This symbolic tree is most carefully tended, but should the tree perish from any cause it is considered that the life of the being it represents is in the utmost jeopardy.[60]

In the region of Vergil's nativity it was likewise the custom to plant a tree when a child was born. A shoot of a poplar tree that was set in the ground at Vergil's birth grew so vigorously that in a short time it was as big as trees which had been planted long before. It became known as "Vergil's tree" and expectant mothers made it a hallowed shrine.[61]

Other miraculous elements are sometimes added to such beliefs. "In an Argyllshire story, three trees spring up at the birth of the fisherman's three sons, and serve in after years as their life-tokens; for if evil befalls either (*sic*) of the boys, his tree is seen to wither." [62]

There is a remarkable classical parallel to this story. On the suburban estate of the Flavii there was an old oak tree, a sort of family tree, that was sacred to Mars. On each of the three occasions when Vespasia gave birth to a child, it sent forth from its trunk a branch that was an obvious indication of the destiny of the new arrival. "The first was slender and quickly withered, and so too the girl that was born died within the year; the second was very strong and long and portended great success, but the

[59] Cox, p. 79. See also Macculloch, as cited in note 427, p. 125.

[60] Porteous, A., *Forest Folklore, Mythology, and Romance* (The Macmillan Co., New York, 1928), p. 182. See also pp. 155–160. Another interesting reference is Frazer, J. G., *The Fasti of Ovid* (Macmillan and Co., London, 1929), 2: 401–405.

[61] Donatus, *Vergilii Vita, initio.* An interesting story is told by Ael. Lamprid., *Alex. Sev.* 13.7. Soon after the birth of Alexander Severus a laurel tree sprang up in his father's house and within a year outgrew a peach tree beside it. Since the peach tree (*malus Persica*) had been introduced into Italy from Persia, the soothsayers predicted that the infant was destined to conquer the Persians.

[62] Cox, pp. 222–223.

third was the image of a tree. Therefore their father Sabinus . . ., being further encouraged by an inspection of victims, announced to his mother that a grandson had been born to her who would be a Caesar." [63]

BIRTH A TRANSMIGRATION

The new-born infant may contain within it something that is not new, but renewed:

> Our birth is but a sleep and a forgetting:
> The Soul that rises with us, our life's Star,
> Hath had elsewhere its setting,
> And cometh from afar.[64]

Wordsworth's melodious lines reflect the ancient belief in transmigration of souls,[65] but perhaps most literary references to it are of a humorous character. In *Twelfth Night* [66] a clown asks: "What is the opinion of Pythagoras concerning wild-fowl?" Malvolio replies: "That the soul of our grandam might haply inhabit a bird." It is worth while to quote another reference to this belief in Shakespeare: "I was never so berhymed since Pythagoras' time, that I was an Irish rat." [67]

A somewhat less relevant passage is to be found in Yeats' play, *The Land of Heart's Desire*.[68] On being asked how old it is the "Faery Child" replies:

> When winter sleep is abroad my hair grows thin,
> My feet unsteady. When the leaves awaken
> My mother carries me in her golden arms.

---

[63] Suet., *Vesp.* 5.2 (J. C. Rolfe's translation in the Loeb Classical Library).

[64] Wordsworth, Wm., *Ode on Intimations of Immortality.*

[65] At the very beginning of the *Recognitiones* (a work wrongly ascribed to Clemens Romanus), the author questions whether he had not existed before he was born. Of the ancient discussions of immortality and the preëxistence of the soul one of the most pleasing is to be found in Cicero, *De Senectute* 21–22. In this essay (21.78) Cato regards as a great proof that men know many things before they are born the fact that when they are learning difficult arts in boyhood they understand innumerable things so quickly that they seem not to be grasping them for the first time, but to be recalling and remembering them. Of course, this idea is to be found in Plato. See *Phaedo* 72 E.

[66] IV.ii.56–57.

[67] *As You Like It*, III.ii.188.

[68] The quotation is rather near the end of the poem.

I'll soon put on my womanhood and marry
The spirits of wood and water, but who can tell
When I was born for the first time? I think
I am much older than the eagle cock
That blinks and blinks on Ballygawley Hill,
And he is the oldest thing under the moon.

The doctrine of metempsychosis is seriously discussed in several of Plato's works,[69] but other references to it are more suitable to my present needs. In a dream during which he saw Homer, Ennius learned that Homer's soul had once animated a peacock, and that it had been relayed to himself through several intermediaries.[70] The divine spark had lost much of its brilliance, however, during transit.

Perhaps the most ardent believer in transmigration was Pythagoras. He had demonstrated his belief.[71] He had once been Euphorbus, whom Menelaus slew beneath the walls of Troy. To prove his claim, he identified in the temple of Hera at Argos the shield which he had carried beneath the famous walls.[72] In his next existence he was the prophet Hermotimus,[73] whose funeral was held prematurely while his soul was out.[74] At one stage, according to Lucian, his soul passed into the body of a cock. When the cock was requested to tell whether Homer gave a true picture of events at Troy, it asked how Homer could have known about them, since at that time he was a camel in Bactria.[75]

In view of the belief that souls of human beings may pass

[69] *Meno* 81 B; *Phaedo* 81 E–82 B, 113 A; *Phaedrus* 248–249 B; *Rep.* 618 A–620 D; *Timaeus* 41 E–42 D, 91 D–92 B.

[70] See the scholium on Persius, *Prol.* 2: " . . . tangit Ennium qui dicit se vidisse somniando in Parnasso Homerum sibi dicentem quod eius anima in suo esset corpore; Tert., *De Anima* 23 (*Patrol. Lat.*, Vol. 2, Col. 750): "pavum se meminit Homerus Ennio somniante"; Ennius, *Ann.*, Book 1, verse 15: "Memini me fiere pavum." These and other similar passages have been collected by Vahlen, J. (B. G. Teubner, Leipzig, 1928), p. 4.

[71] On the "Previous Lives of Pythagoras" see Rohde, pp. 598–601. The cock of Lucian's *Gallus*, 20, had been a king, then a poor man, and soon a satrap; then a horse, a jackdaw, a frog and a thousand things besides.

[72] Ovid, *Met.* 15.160–164.

[73] For references see Rohde, p. 599.

[74] Pliny 7.174. On the wandering of the soul from the body see Wuttke, pp. 54–55.

[75] Lucian, *Gallus* 17.

into beasts it is easy to understand why Pythagoreans were averse to eating the flesh of animals.[76]

According to a belief which was probably mistakenly attributed to the Egyptians by Herodotus,[77] it took three thousand years [78] for a soul to complete its round of animals and birds and fishes before returning to a human habitation.[79]

In transmigration, as in religions and philosophies, the good may be rewarded and the evil punished. It is said in our own country that "Mean negroes return after death as mules," [80] and that "All bricklayers will turn to gray mules when they die." [81] In the *Phaedo* [82] of Plato Socrates expresses the opinion that gluttons, wanton people and drunkards become asses and animals of that sort and that those who have been given to injustice, tyranny and violence become wolves, hawks and kites.[83] There is no hint that Socrates is laughing up his sleeve. Plato [84] tells of fish and oysters and aquatic animals suffering in the most re-

[76] Cf. Ovid, *Met.* 15.173–175:

"Ergo — nec pietas sit victa cupidine ventris —
Parcite, vaticinor, cognatas caede nefanda
Exturbare animas; nec sanguine sanguis alatur."

[77] 2.123. Rohde, p. 346, thinks it "not even probable that a belief in transmigration ever really existed in Egypt."

[78] In Plato, *Phaedrus* 248 E, the number is given as ten thousand years, but in 249 A–B and in *Rep.* 615 A it is one thousand years.

[79] Cf. Verg., *Aeneid* 6.727–729:

"Mens agitat molem et magno se corpore miscet.
Inde hominum pecudumque genus vitaeque volantum
Et quae marmoreo fert monstra sub aequore pontus."

[80] Thomas and Thomas, p. 257, No. 3455. I suspect that the Negroes imported this belief from Africa. Cf. Besterman, as cited in note 88, p. 73: "Evil men, they say, enter at their death into the lower animals, and are then punished by the sufferings which these beasts undergo. The worst and fiercest spirits enter in such beasts as the leopard; hence the great rejoicings when a leopard is killed. Parrots, dogs, tame monkeys, and the innocuous animals are not troubled with these wicked spirits."

[81] Thomas and Thomas, p. 257, No. 3456.

[82] 81 E–82 B.

[83] Rohde, p. 483, gives one access to much source material on incarnation in animals.

[84] *Timaeus* 92 A–B. Cf. Servius on Vergil, *Aeneid* 3.68: " . . . Plato perpetuam dicit et animam ad diversa corpora transitum facere statim pro meritis prioris vitae. . . ." According to Iamblicus, *De Vita Pythag.* 18.85, the soul did not pass into animals which it was permitted to kill.

mote habitations, the depths of seas, the penalty of their utter ignorance in prior existences.

The workings of the doctrine of metempsychosis become more intelligible if one assumes, as Plato did,[85] that there is a fixed number of souls in the world. This idea makes of birth merely a transit of the soul from one container to another.

There are other things that make it easier to understand the belief in transmigration. One of them is the tendency of savages and near savages to put animals on a par with themselves. An illustration of this may be found in Booker T. Washington's *Up from Slavery*.[86] An old Negro, on being asked how many were sold along with himself, replied: "There were five of us; myself and brother and three mules." This recalls a poem in which Voltaire describes a muleteer whose nature was so stupid and crass that he scarcely realized any change when he was transformed into a mule.[87]

The belief in transmigration is found today among a large number of African tribes.[88] It seems that it has always been characteristic of a low stage of society.[89] Even the refinements of Plato could not make it popular in Greece.

OMENS OF NAMES

At the present time there seems to be but little attention paid by parents to omens in names. This is doubtless due to the fact that the etymologies of proper names are not so obvious as they were in antiquity.[90] There still exist, however, examples

[85] *Timaeus* 41 D–E.

[86] Pp. 116–117 (Doubleday, Page & Co., Garden City, New York, 1906).

[87] I have not been able to find this in the original, but Rohde, p. 361, n. 82, gives the quotation: "et du vilain l'âme terrestre et crasse à peine vit qu'elle eut changé de place."

[88] A remarkable collection of examples has been made by Besterman, Th., "The Belief in Rebirth among the Natives of Africa (Including Madagascar)," *Folk-Lore*, 41 (1930) : 43–94. [89] See Rohde, pp. 263–265, 346, 361, n. 81.

[90] For much curious lore of names and for valuable references to the history of the subject see Pease, A. S., on Cicero, *De Divinatione* 1.102 (*M. Tulli Ciceronis de Divinatione*, University of Illinois Studies in Language and Literature, Vols. VI and VIII). See also McCartney, E. S., "Puns and Plays on Proper Names," *Class. Journ.*, 14 (1919) : 343–358.

of the belief that proper names have latent powers for good or evil.

A novel of Negro life represents a mother as undecided about a suitable name for her baby.[91] "She couldn't decide in a hurry. Sometimes a wrong name will even kill a baby. She must go slow and choose a name that was certain to bring her baby health and luck."

In parts of Germany names in which the word *Erd*, "earth," appears, e.g. "Erdmann," protect children from an early death.[92]

It has been suggested that "The Christian custom of naming children after saints perhaps shows a survival of the desire for names of good omen." [93]

Even ships need names of good augury. A seventeenth-century volume says that merchants "call their ships by many prosperous names: the *Success*, the *Good Speed*, the *Triumph*, the *Safeguard*. How vain doth one rock prove all these prosperous titles." [94]

Roman parents, too, were superstitious about names. Sulla called his twin children Faustus and Fausta,[95] i.e. "Auspicious." A Roman father and mother, whose own names, Salvius Victor and Valeria Agathemeris, were of good augury, named their children Salvius Felix and Salvia Valeriana because of the omen of happiness and health.[96]

Persons with lucky names were in demand by the Romans when projects were inaugurated. In making levies the consuls took heed that the first soldiers enrolled should have such names

[91] Peterkin, Julia, *Black April*, p. 30. Cf. Polson, A., *Our Highland Folklore Heritage* (George Souter, Dingwall, 1926), p. 7: "There are certain names of evil omen which are not to be thought of."

[92] Wuttke, p. 15.

[93] Pease, *loc. cit.* Pease aptly quotes Cassiodorus, *Varia* 5.3, where the following comments are called forth by the names Honoratus and Decoratus: "O vere vestris meritis electi et auspicio nominis honorati! Praesentiunt quaedam parentes, positis in prole vocabulis, et ut venturarum rerum cursus ex alto est imperio divinitatis, cogitatio praesagantis instruitur; loqui datur quod nos sensisse nescimus, sed post casum reminiscimur quod ignorantes veraciter dixeramus."

[94] Adams, T., *Works* (1629), p. 324, as quoted by Lean, as cited in note 117, Vol. 2, Part I, p. 324.

[95] Plut., *Sulla* 34.3.

[96] See *Corpus Inscriptionum Latinarum*, 13, No. 2255.

as Valerius (cf. *valere*, "to be strong"), Salvius (cf. *salvere*, "to be safe and sound"), and Statorius (cf. *stare*, "to be steadfast").[97] On the occasions of public lustrations persons with auspicious names were selected to lead the victims.[98] Likewise, soldiers with such names were the first to enter the city of Rome during the military formalities that accompanied the decision made in 70 A.D. to restore the Capitolium.[99] Cicero was suspicious of the motives of his legal adversaries when they put on the stand a man named Valerius.[100]

It will be recalled in this connection that the name of the Christ child was not a matter of chance, for he was to live his name. "Thou shalt call his name Jesus, for he shall save his people from their sins." [101]

KEEPING NAME SECRET

In parts of England "It is unlucky to divulge a child's name before its baptism." [102] This is undoubtedly a survival in a very limited sphere of a superstition that once had a far wider application. There was a time when the knowledge of a person's name gave an enemy a magical handle wherewith to work injury. The reader who is versed in fairy tales will doubtless recall how Rumpelstilzchen, when his name was discovered by the captive queen, seized his left foot with both hands and tore himself in two.[103]

Such ideas existed in early Latium. We are told that during

[97] Festus, p. 108 (W. M. Lindsay's edition).

[98] Cicero, *De Div.* 1.102; Pliny 28.22.

[99] Tac., *Hist.* 4.53.

[100] *Pro Scauro* 13.29–30.

[101] Matthew i.21.

[102] *Folk-Lore Record*, 1 (1878) : 11. See also Polson, as cited in note 91, pp. 6–7: "It has long been held that the sooner the [christening] ceremony is over the better it is for the child. There is first the danger of stupid women, and stupider men, who will persist in asking what the child's name is, though all ought to know that it is very unlucky to divulge it until it is first of all pronounced by the officiating clergyman."

[103] Cf. Wuttke, p. 446: "Kennt man die Hexe, die dem Viehe etwas angethan, so stiehlt man ihr heimlich etwas Futter und mischt es unter das Futter des eignen Viehs, so ist aller Zauber fort, und die Hexe kann ihm auch ferner nichts anthun."

sieges Roman priests called forth the guardian deities of cities and promised them equal or even greater reverence in Rome. Pliny explains that the name of the protecting divinity of Rome was kept secret in order that the enemy might not treat it in a similar manner.[104] For the same reason even the original name of the city by the Tiber was zealously guarded.[105]

In remote antiquity names of things were regarded as the essence of the objects for which they stood. In fact, the science of etymology as well as the word "etymology" originated in the Greek desire to find the *etymon* of words, their essence or real inwardness, so that they might use them more effectively. It is difficult for us to realize the power that was supposed to reside in words when spoken in prescribed forms and formulae,[106] but good examples are to be found in the *Kinder- und Hausmärchen* of the Grimm brothers. In one of them [107] a father is reluctant to carry out a compact he made with a lion, since he fears it will mean the death of his daughter, but the child thus admonishes him: "Liebster Vater, was Ihr versprochen habt, muss auch gehalten werden." In the story called "Die Rabe" [108] a queen wishes that her child would turn into a raven and fly away. "Kaum hatte sie das Wort gesagt, so war das Kind in eine Rabe verwandelt und flog von ihrem Arm zum Fenster hinaus."

BAPTISM

According to Baring-Gould [109] it was believed in Yorkshire that "the first child baptized in a new font is sure to die." He

[104] 28.18. Livy, 5.21–22, tells how Juno was lured from Veii in this fashion. Macrobius, *Sat.* 3.9.7–8, preserves the formula used at the siege of Carthage.

[105] Macrob., *Sat.* 3.9.3–6. Many references to this general subject are collected by Smith, K. F., *The Elegies of Albius Tibullus* (American Book Co., New York, 1913), pp. 222–223. See also Jerome, T. S., *Aspects of the Study of Roman History* (G. P. Putnam's Sons, New York, 1923), p. 185. For a wider treatment of this subject see Frazer, J. G., "Personal Names Tabooed," *Taboo and the Perils of the Soul* (as cited in note 32), pp. 318–334.

[106] Cf. Livy 5.15.10: "Itaque quae tum cecinerit divino spiritu instinctus, ea se nec ut indicta sint revocare posse. . . ." See also Pliny 28.10.13.

[107] No. 88, according to the numbering of the edition published by M. Hesse, Leipzig, n.d. [108] No. 93.

[109] The quotations from S. Baring-Gould in this and the next paragraph are taken at second hand from Henderson, p. 121.

calls this "a reminiscence of the sacrifice which was used for the consecration of every dwelling and temple in heathen times, and of the pig or sheep killed and laid at the foundation of churches."

He then recounts an interesting experience of his own:

> When I was incumbent of Dalton a new church was built. A blacksmith in the village had seven daughters, after which a son was born, and he came to me a few days before the consecration of the new church to ask me to baptize his boy in the old temporary church and font. "Why, Joseph," said I, "if you will only wait till Thursday the boy can be baptized in the new font on the opening of the new church." "Thank you, Sir," said the blacksmith, with a wriggle, "but you see it's a lad, and we shu'd be sorry if he were to dee; na if t'had been a lass instead, why then you were welcome, for 'twouldn't ha' mattered a ha'penny. Lasses are ower mony and lads ower few wi' us."

Ancient practice leaves a survival of a little different character in other countries. "In modern Greece, when the foundation of a new building is being laid, it is the custom to kill a cock, a ram, or a lamb, and to let its blood flow on the foundation-stone, under which the animal is afterwards buried. The object of the sacrifice is to give strength and stability to the building." [110]

A custom so ingrained in the national character of Greece doubtless existed in antiquity, although I have no classical counterpart that is analogous in every detail. It is noteworthy, however, that during the siege of Troy Poseidon complained to Zeus that the long-haired Achaeans were building a wall and running a trench without offering a hecatomb.[111]

According to one tradition a brazen crow (κορώνη) was found during the excavating for the foundations of Coronea.[112] This story may have been invented to account for the name of the city; but the Romans thought it a good omen when, while digging to make foundations for the celebrated temple of Capitoline

[110] Frazer, J. G., as cited in note 32, p. 89. See also Elworthy, pp. 79–83; Sébillot, P., "Les Rites de la construction," *Le Folk-lore de France* (E. Guilmoto, Paris, 1904–7), 4 : 89–99; Tylor, E. B., *Primitive Culture* (J. Murray, London, 1920), 1 : 104–106. There is a fascinating discussion of this general subject by Baring-Gould, S., "On Foundations," *Murray's Magazine*, 1 (1887) : 363–377.

[111] *Iliad* 7.446–450.

[112] Paus. 4.34.5.

Jupiter, they found the head of a human being.[113] May the belief in the good omen of the finding of the head have been a survival of an older custom of walling in victims?

BREAKING EGGSHELLS

Children and even adults are still in danger from witches. Sir Thomas Browne writes:[114] "To break the egg shell after the meat is out, we are taught in our childhood, and practise it all our lives; . . . and the intent hereof was to prevent witchcraft; for lest witches should draw or prick their names therein, and veneficiously mischief their persons, they broke the shell, as Delecampius hath observed." Pricking a discarded eggshell could cause as much injury as pricking a waxen image of a person.[115]

The custom of crushing the shell seems to be common in England even today.[116] A version of this superstition [117] which was collected in or near Philadelphia late in the last century runs as follows: "The shell of an egg should always be broken into pieces, or else witches will use them to ride in."

According to another version, if one fails to poke a hole through an eggshell before throwing it away the fairies will put to sea and wreck ships.[118]

I am told by a member of the French department of the University of Michigan that as late as the generation preceding his it was table etiquette in France to break the shells of eggs.[119]

[113] Pliny 28.15. See McCartney, E. S., "The Omen of the Buried Horse's Head in Vergil's *Aeneid*," *Class. Journ.*, 22 (1927) : 674–676.

[114] *The Works of Sir Thomas Browne*, edition by Keynes, G. (Faber & Gwyer, London, 1928 —), 3 : 143.

[115] See the note in the Bohn translation of Pliny, Vol. 5, p. 282.

[116] Halliday, p. 63; Frazer, J. G., as cited in note 32, pp. 129–130.

[117] Phillips, Henry, Jr., "First Contribution to the Folk Lore of Philadelphia and Its Vicinity," *Proc. Am. Philosoph. Soc.*, 25 (1888) : 166, No. 52. Cf. Lean, V. S., *Collectanea* (Bristol and London, 1902–4), 2 : 148–149.

[118] *Notes and Queries*, 7 (1853) : 152. A superstition collected by Thomas and Thomas, p. 281, No. 3811, is rather specific: "It is unwise to keep egg shells because witches go to sea in them. Burn the shells."

[119] Compare the following remark in the Bohn translation of Pliny, Vol. 5, p. 282: "We learn from Ajasson that till recently it was considered a mark of ill-breeding in France not to pierce the shell after eating the egg."

The original significance of this act seems to have been lost in France, but there can be hardly any doubt that the practice was inherited from Roman times. Pliny [120] tells us that eggshells were broken or pierced through fear of spells and imprecations.

EARLY DEATH OF GOOD AND TALENTED CHILDREN

We say that the good die young. The same thing is said of talented children. As Shakespeare puts it,[121] "So wise so young, they say, do never live long." In Germany, too, it is proverbial that gifted children do not grow old.[122] "'Whom the gods love die young' was said of yore." [123] Among the Romans precocity was a sign of an early death.[124] They said also that those whom the gods love die young.[125] One of their peculiar superstitions was that children who were quick in learning to speak were late in learning to walk.[126]

DISPOSAL OF CLIPPINGS OF HAIR

I once heard a cultured woman say that she threw into the fire the milk teeth of her children as they dropped out and also the clippings of their hair. This method of disposal kept witches from getting them.[127]

> Some devils ask but the parings of one's nail,
> A rush, a hair, a drop of blood, a pin,
> A nut, a cherry-stone.[128]

Among the Romans "cuttings were often carefully preserved, for fear that someone might use them for magical purposes." [129]

[120] 28.19. [121] *Richard III*, III.i.79.

[122] "Kluge Kinder werden nicht alt." See Otto, as cited in note 124.

[123] Byron, *Don Juan*, Canto 4, Stanza 12.

[124] Pliny 7.172: ". . . senilem iuventam praematurae mortis esse signum." See also Otto, A., *Die Sprichwörter und sprichtwörtlichen Redensarten der Römer* (B. G. Teubner, Leipzig, 1890), p. 375, No. 1917.

[125] Plaut., *Bacch.* 816–817: "Quem di diligunt, adulescens moritur." See the story of Cleobis and Biton as told by Herodotus 1.31.

[126] Pliny 11.270.

[127] On the burning of children's milk teeth, nails and hair see Elworthy, p. 76.

[128] Shakespeare, *The Comedy of Errors*, IV.iii.72–74.

[129] Halliday, p. 63.

It may be noted that Trimalchio kept the trimmings of his beard in a golden box.[130]

We are told that the vestal virgins used to hang the clippings of their hair on a lotus tree, which for that reason was called "hairy." [131] "The motive of thus depositing the shorn tresses was probably to prevent them from falling into the hands of witches or wizards, who by working magic on them might thereby have wrought serious harm to the Virgins." [132]

PRAISE A MENACE

A danger that has ever encompassed children is excessive praise. Today mothers are warned not to love or worship their children too much. In Ian Maclaren's story of "Domsie" in *Beside the Bonnie Brier Bush* there is a good illustration. The following reflections are addressed to the mother of a boy who, after winning high honors in college and being much praised by relatives and others, had come home to die:

> Ay, ay, it's a sair blow aifter a' that was in the papers. I was feared when I hear o' the papers: "Lat weel alane," says I to the Dominie; "ye 'ill bring a judgment on the laddie wi' yir blawing." But ye micht as well hae spoken to the hills. Domsie's a thraun body at the best, and he was clean infatuat' wi' George. Ay, ay, it's an awfu' lesson, Marget, no to mak' idols o' our bairns, for that's naethin' else than provokin' the Almichty.[133]

A modern Greek superstition gives the following admonition: [134] "Do not be too eager to compliment a mother on the birth of an infant, but remain at least half an hour in the house before entering her room, lest rejoicing should turn to lamentation."

[130] Petronius 29.8.

[131] Pliny 16.235; Festus, *s.v. Capillatam* (Lindsay's edition, p. 50).

[132] Frazer, as cited in note 60, 4: 384.

[133] See also Gregor, pp. 7–8; Maclagan, pp. 74, 76–79; Dalyell, as cited in note 32, pp. 12–13.

[134] *Folk-Lore Journal*, 1 (1883): 220. Cf. Lane, E. W., *The Manners and Customs of the Modern Egyptians* (Everyman's Library), p. 256: "It is also a common custom of the people of Egypt, when admiring a child, to say, 'I seek refuge with the Lord of the Day-break for thee': alluding to the Chapter of the Day-break (the 113th chapter of the Ḳur-án); in the end of which, protection is employed against the mischief of the envious."

Another example of the danger of praise or approval is to be found in Kipling's story "Without Benefit of Clergy": [135]

"It was because we loved Tota that he died. The jealousy of God was upon us," said Ameera. "I have hung up a large black jar before our window to turn the Evil Eye from us, and we must make no protestations of delight, but go softly underneath the stars, lest God find us out. Is that not good talk, worthless one?"

She had shifted the accent of the word that means "blessed," in proof of the sincerity of her purpose. But the kiss that followed the new christening was a thing that any deity might have envied. They went about henceforth saying: "It is naught — it is naught," and hoping that all the powers heard.[136]

Inadvertent or unguarded expressions of praise may bring evil in their train, but a passage in K. Bercovici's *Alexander* [137] shows that praise may be employed wilfully to inflict injury, even upon adults:

Iskander, isolated, haughty, was sad, angry, and cruel. He asked for neither counsel nor advice, and listened only to the flatterers who chanted his growing megalomania. Ben Sasra understood.

"Their chants of praise are funeral chants. No man could outlive such praise. Our books say: Praise is deadly. There existing no material weapon to destroy Iskander, the Indians are using the most deadly spiritual one: praise."

There is but little in these quotations that might not be lineally descended from Greek and Roman views of praising, as we may see by a passage in Arrian's *Epictetus:* [138]

Whenever you grow attached to something, do not act as though it were one of those things that cannot be taken away, but as though it were something like a jar or a crystal goblet, so that when it breaks you will remember what it was like, and not be troubled. So too in life; if you kiss your child, your brother, your friend, never allow your fancy free rein, nor your exuberant

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[135] Chap. 3. The story is one of those in *Mine Own People.* For this example I am indebted to Miss Henriette Scranton.

[136] In the same story of Kipling's there occur the following sentences: "There are not many happinesses so complete as those that are snatched under the shadow of the sword. They sat together and laughed, calling each other openly by every pet name that could move the wrath of the gods."

[137] P. 266 (Cosmopolitan Book Corporation, New York, 1928).

[138] 3.24.84–87 (W. A. Oldfather's translation in the Loeb Classical Library).

spirits to go as far as they like,[139] but hold them back, stop them, just like those who stand behind generals when they ride in triumph, and keep reminding them that they are mortal. In such fashion do you too remind yourself that the object of your love is mortal: it is not one of your own possessions; it has been given you for the present, not inseparably, nor for ever, but like a fig, or a cluster of grapes, at a fixed season of the year, and that if you hanker for it in the winter you are a fool. If in this way you long for your son, or your friend, at a time when he is not given to you, rest assured that you are hankering for a fig in winter-time. For as winter-time is to a fig, so is every state of affairs, which arises out of the universe, in relation to the things which are destroyed in accordance with that same state of affairs.

The dangers arising from being praised are rather generally recognized in Asia as well as in Europe,[140] but there is no reason to suppose that our beliefs did not come directly from peoples of Indo-European stock.

The principle of disparagement may be readily illustrated from the vegetable kingdom also. Some forms of vegetation may get a bad start in life if precautions are not taken. In order to insure a fair and abundant crop of cumin, the Greeks cursed and abused the seed while sowing it.[141] Among the Cyprians cursing seems to have been a fundamental qualification for successful farming, for they spoke of "sowing curses."[142] Sometimes prayers were offered that the seed might never come up.[143] Even first fruits

[139] Cf. Lyly, John, *Endimion*, V.iii: "Ah, happie Eumenides, that hast a friend so faithfull and so fair: with what sodaine mischiefe will the gods daunt this excesse of ioye?" See also Shakespeare *I Henry IV*, IV.i.111–112:

> ". . . Worse than the sun in March
> This praise doth nourish agues."

[140] Numerous examples from many parts of the world have been collected by Lean, as cited in note 117, 2: 466–467, 469, 473–475. See also *Zeitschrift für Ethnologie*, 15 (1883): 90; *The Folk-Lorist*, 1 (1892): 73.

[141] Theophr., *De Plantis* 7.3.3; 9.8.8; Plut., *Symp.* 7.2.2; Pliny 19.120. Palladius, 4.9.14, says the same thing about sowing rue. Cf. Thomas and Thomas, p. 218, No. 2868: "Never thank the giver for seeds if you want them to grow"; *Journ. of Am. Folk-Lore*, 40 (1927): 191, No. 1121: "Never thank a person who gives you a plant; it will not grow if you do." Other examples are given by Mozley, J. H., *Ovid, The Art of Love, and Other Poems* (Heinemann, London, 1929), p. 362.

[142] Hesychius, *s.vv.* ἀρὰς ἐπισπεῖραι. ἔθος Κυπρίων σπειρόντων κριθὰς μεθ' ἁλὸς καταρᾶσθαί τισιν.

[143] Pliny 19.120.

were exposed to slighting remarks by the Romans. They would say: "These are old; we desire other and fresh fruits.[144]

From the examples given it is evident that decrying is the cheapest insurance against evil and misfortune. It is sometimes difficult, however, to profit by information that is available. Scotch Marget of Ian Maclaren's story lost her son although her neighbors in Drumtochty held that "a skilful depreciation of our children was a measure of safety."

In Scotland the blighting effects of praise may be offset by extravagant praise as well as by belittling remarks: [145]

> Mrs. M'F. from Knapdale resided in Glasgow for some time after her marriage. She was standing at the mouth of the close one day with her first child in her arms when a little woman whom she had never seen before, and never saw again, as far as she knows, came across the street, and looking at the child began to praise it for its beauty. Mrs. M'F. had not the presence of mind to praise it above what the other woman said, nor to miscall it. Had she done either it would have prevented mischief. As it was, the child began to cry as soon as the little woman went away. It continued crying for a day and a half, and never was right afterwards. The child died. Mrs. M'F. was quite certain it had been injured by the eye of the little woman.

As we have seen, disparagement was an effective prophylactic against praise, but many persons placed their sole reliance upon spittle, to which numerous and varied virtues have always been attributed.[146]

Another Scotch woman whose child in arms was praised as "a pretty, dear boy" without more ado "turned the child's face to her and began to spit in it as hard as she could to prevent any bad effect from the other woman's Evil Eye." [147]

[144] Pliny 28.23.

[145] Maclagan, p. 118. On page 117 there is an illuminating tale of the way in which a farm hand saved a pair of fine horses by making belittling remarks in reply to everything complimentary said about them. See also pp. 114–116, and Polson, A., *Our Highland Folklore Heritage* (George Souter, Dingwall, 1926), p. 117.

[146] See, for example, Nicolson, F. W., "The Saliva Superstition in Classical Literature," *Harvard Studies in Class. Phil.*, 8 (1897) : 23–40; Hastings, J., *Encyclopaedia of Religion and Ethics*, 11 : 100–104, *s.v.* "Saliva"; Halliday, pp. 35–36; Mayor, J. E. B., on Juvenal 7.112.

[147] Maclagan, p. 126. See also Cox, p. 229; Polson, as cited in note 145, p. 114.

Modern Greece adheres just as firmly to the belief in the prophylactic value of spittle, as has been attested by the traveler Dodwell: [148]

> The first place where I discovered this superstition was in the island of Corfu. I was taking a view near a cottage into which I was kindly invited, and hospitably entertained with fruit and wine. Two remarkably fine children were playing about the cottage; and as I wished to pay a compliment to the parents, I was lavish in my praises of their children. But when I had repeated my admiration two or three times, an old woman, whom I suppose to have been the grandmother, became agonized with alarm, and starting up, she dragged the children towards me, and desired me to spit in their faces. This singular request excited so much astonishment, that I concluded the venerable dame to be disordered in her intellects. But her importunities were immediately seconded, and earnestly enforced, by those of the father and mother of the boys. I was fortunately accompanied by a Greek, who explained to me, that in order to destroy the evil effects of my superlative encomiums, the only remedy was, for me to spit in the faces of the children. I could no longer refuse a compliance with their demands, and I accordingly performed the unpleasant office in as moderate a manner as possible. But this did not satisfy the superstitious cottagers; and it was curious to see with what perfect tranquillity the children underwent the nasty operation; to which their beauty had probably frequently exposed them. The mother then took some dust from the ground, and mixing it with some oil, from a lamp which was burning before a picture of the Virgin, put a small patch of it on their foreheads. We then parted perfectly good friends; but they begged of me never to praise their children again.

The ancients had customs of the same general character. They spat upon their own garments to avoid the evil effects of self-praise.[149] Even rough old Polyphemus, through whose uncouth exterior it would seem that nothing could have penetrated, spat thrice upon his breast when he found beautiful a reflection of himself in the water.[150] A certain Eutelidas failed to take such a precaution when he was enravished by his own beauty and thus bewitched himself.[151]

[148] Dodwell, Edward, *A Classical and Topographical Tour through Greece during the Years 1801, 1805, and 1806* (London, 1819), 2.35–36. On the evil eye see also pp. 30–34.

[149] Cf. Pliny 28.35: "Veniam a dis spei alicuius audacioris petimus in sinum spuendo. . . ." Callimachus, *Frag.* 235, asks why women spat upon the breasts.

[150] Theocr. 6.34–39. Narcissus took no precautions when he felt a consuming passion for the beautiful reflection of himself in a pool and so pined away and died. See Ovid, *Met.* 3.346–510.

[151] Plut., *Symp.* 5.7.4. Another example of self-bewitching is given in this reference.

The danger of praise, or "forespeaking," as the Scotch call it, is greatest when it is of an envious nature [152] and also when it is uttered by a person with the evil eye.[153] We learn from Pliny [154] that the powers of fascination of some families in Africa were so strong that through their praises infants died, cattle perished,[155] and trees withered.[156] In an Ethiopian romance written by Heliodorus [157] a beautiful heroine, who has been seen by an admiring multitude during a procession, becomes sick and retires to her room. The father is told that she has been seen by some spiteful eye.

Children were especially susceptible to the evil eye [158] and the Romans created a goddess Cunina whose function it was to protect them in the cradle. Cunina had some assistance, however,

[152] Cf. Gregor, p. 35: "Praise beyond measure — praise accompanied with a kind of amazement or envy — was followed by disease or accident." It is also true, however, that admiration of a good-looking child, a spirited horse, a blooming garden or a new house aids the evil eye. See Abbott, as cited in note 51, pp. 140–141.

[153] Tert., *De Virginibus Velandis* 15 (Migne, *Patrol. Lat.*, Vol. 2, Col. 959): "Nam est aliquid etiam apud ethnicos metuendum quod fascinum vocant, infeliciorem laudis et gloriae enormioris eventum."

[154] 7.16.

[155] For the workings of the evil eye upon cattle in Scotland see Gregor, pp. 184–185. An example from Germany is to be found in Strackerjan, L., *Aberglaube und Sagen aus dem Herzogtum Oldenburg* [2] (G. Stalling, Oldenburg, 1909), 1 : 374: "Es ist vorgekommen, dass eine Hexe von einem Schweine gesagt hat: ‚Das ist ja ein schönes Schwein,' und alsbald ist das Schwein hingefallen und krepiert."

[156] In a note at the end of *The Last Days of Pompeii* Bulwer-Lytton tells how a Neapolitan lady became distracted when she overheard a man with the evil eye praise her cap.

[157] *Aethiopica* 3.140: cf. Horace, *Epist.* 1.14.37–38:

> "Non istic obliquo oculo mea commoda quisquam
> Limat, non odio obscuro morsuque venenat."

A close Roman parallel is to be found in an epigram called "In Sepulchrum Speciosae," by Claudian, *Epigrammata* 91 (41):

> "Pulchris stare diu Parcarum lege negatur;
> Magna repente ruunt; summa cadunt subito.
> Hic formosa iacet Veneris sortita figuram,
> Egregiumque decus invidiamque tulit."

[158] Alex. Aphrod. 2.53.

for Persius tells [159] how a granny or an aunt skilled in averting the evil eye would take a child from the cradle and apply spittle to the forehead. People of mature years warded off fascination by spitting.[160]

Another ancient antidote against the evil eye in case of excessive praise was the plant *baccar* [161] worn around the forehead:

> Aut si ultra placitum laudarit, baccare frontem
> Cingite, ne vati noceat mala lingua futuro.[162]

Even simpler remedies have been devised. Over a century ago Dodwell found the Italians preventing the bad effects of superlative praise by exclaiming: "Mal occhio non ci possa!" [163] The same author makes another interesting observation on this subject: [164] "In the mountainous parts of Italy, where ancient customs are preserved, the person who is the object of praise says, on such occasions — 'Si mal occhio non ci fosse': meaning, that the praise would be acceptable if sincere and unattended with envy."

These remedies seem too crude to combat the subtle powers of the evil eye, but perhaps few people knew how mysterious they were. The workings of the evil eye are thus explained by Heliodorus: [165]

> The air which is about us on every side, entering into us by our eyes, nostrils, mouth and other pores, carrying with it such outward qualities as it is endued withal, doth ingraft a like infection in them who have received it. For which cause, when a man hath enviously looked upon any excellent thing, forthwith he hath filled the air with that pestilent quality, and sent forth also

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[159] 2.31–34. Pliny, 28.39, says that looking upon a sleeping child would cause a nurse to spit upon its face three times. See also Pliny 28.76; Petronius 131.

[160] Pliny 28.35: "Simili modo [i.e. despuendo] et fascinationes repercutimus."

[161] Regarded by some as the purple foxglove.

[162] Verg., *Ecl.* 7.27–28. See also Servius, *ad loc.*, and on *Ecl.* 4.19.

[163] 2 : 36, as cited in note 148.

[164] 2 : 35.

[165] *Aethiopica* 3.140–141, translation by Underdowne, T., and Wright, F. A. (G. Routledge & Sons, London, n.d.), p. 96. A somewhat similar explanation of the technique of bewitching is to be found in Plutarch, *Symp.* 5.7. See also Alex. Aphrod. 2.53.

a poisoned breath to that which is near at hand. The same air, being a slender and suitable thing, pierceth even to the bones and very marrow, and by that means envy hath been cause to many of the disease which we call by its proper name "bewitching."

PART II: LOVE AND MARRIAGE

THE RING

Love and marriage, too, have their peculiar superstitions. It is but natural that some of them should have had a long tradition.

Like us, both Greeks and Romans wore rings upon the third finger of the left hand. We are told by a certain Apion, who was learned in the wisdom of the Egyptians, that when they opened corpses they found a very delicate nerve which ran from this finger to the heart.[166] Since the heart is the seat of love, it is appropriate for the third finger to wear the engagement ring.

THE APPLE OF LOVE

In the lore of love an expression familiar to everybody is "apple of love," although it is not a matter of common knowledge that not all the apples of love of antiquity were apples as we know them.[167] Some were oranges, some were pomegranates, and some were quinces. I have no exact modern parallel to the ancient custom of throwing apples and fruit of the apple kind as a token of love, but traces of ancient beliefs are common enough in love oracles from seeds and parings of these fruits.[168]

We say, for instance: "Name apple seeds and shoot them at the ceiling. The one that hits the ceiling shows which one loves you best." [169] In England "The maidens in Durham have their own way of testing their lovers' fidelity. They will take

[166] Aulus Gellius, *Noct. Att.* 10.10. See also *Class. Weekly* 12 (1918) : 20; *The Works of Sir Thomas Browne*, as cited in note 114, 3 : 16–20.

[167] See Foster, B. O., "Notes on the Symbolism of the Apple in Classical Antiquity," *Harvard Studies in Class. Phil.*, 10 (1899) : 39–55; McCartney, E. S., "How the Apple Became the Token of Love," *Trans. and Proc. of Am. Phil. Assn.*, 56 (1925) : 70–81.

[168] See, for example, Thomas and Thomas, pp. 25–26, Nos. 200–212; p. 41, Nos. 376–377; Bergen, pp. 38–40, Nos. 164–173.

[169] Thomas and Thomas, p. 25, No. 207.

an apple-pip, and, naming the lover, put the pip in the fire. If it makes a noise as it bursts with the heat, she is assured of his affection; if it burns away silently, she will be convinced that he has no true regard for her." [170] Even in antiquity pips squeezed from the finger tips indicated success in love if they struck the ceiling.[171]

I have tried elsewhere to prove "that fertility was symbolized by growths with several or many seeds and that it was because the apple was so popular that it gained first place among fruits in 'the office and affairs of love.'" [172]

LOVE DIVINATION BY THE LEFT STOCKING

It is stated in the *Denham Tracts* [173] that at Wooler servant girls who wish to dream of their future husbands sleep with the stockings from their left legs tied around their necks.

In commenting on this an English writer says: [174] "It is curious that the Romans believed in the luck of the left,[175] thus standing in opposition to the more general belief in the luck of the right, and the luck of the left belongs to the Roman wall district of northern Britain, whereas the luck of the right and the unluck of the left is found further south, and in the distinctly Teutonic parts of Britain."

Another modern investigator says that the custom of driving to the left in Rome instead of to the right is undoubtedly connected with luck and he attributes it to the persistence of old traditions.[176]

[170] Henderson, p. 106.

[171] Poll. 9.128; Hor., *Sat.* 2.3.272–273.

[172] P. 81 of second article cited in note 167.

[173] 2: 281. This work may be consulted in the *Publications of the Folk-Lore Society*, Vols. 29 and 35.

[174] Gomme, J. L., on page ix of the second volume of *Denham Tracts*, in publication just cited.

[175] There is nothing curious about the belief in the luck of the left side, which was unlucky when the Romans faced the south in taking auguries. Even our word "sinister" shows that the left side was not always lucky among the Romans.

[176] Frothingham, A. L., *Am. Journ. Arch.*, 21 (1917): 201. It is worth while to give reference here to a series of papers by the same author on "Ancient Orientation Unveiled," *op. cit.*, 21 (1917): 55–76, 187–201, 313–336.

CARRYING THE BRIDE OVER THE THRESHOLD

In parts of our own country it indicates bad luck for a bride to stumble at her husband's door.[177] In order to avoid such misfortune superstitious Scotch people carry the bride over the threshold of her new home. A Scotch investigator says that this is but one of many Roman marriage customs that still survive in Scotland.[178] One of the interesting Latin references [179] to the subject is to be found in Lucan's *Pharsalia:* [180]

> Turritaque premens frontem matrona corona
> Translata vetuit contingere limina planta.

This usage caused some friction between early Christians and pagans, for converts to Christianity refused to take part in the ceremony of lifting the bride over the perilous entryway.[181]

ENTERING CHURCH WITH THE RIGHT FOOT FIRST

We have a superstition that "A bride must step over the church sill with her right foot."[182] Among the Romans it was advisable for everyone to enter temples right foot first. In fact, the architect Vitruvius recommended having an odd number of steps in front of temples, so that if a person made the first step with the auspicious foot he would automatically enter the temple with the same foot first.[183]

There are some supernatural dangers attendant upon marriage. One of our superstitions is that May is a bad month for marriage, especially the fourteenth.[184] In England, too, this month is

[177] Thomas and Thomas, p. 70, No. 703.

[178] Simpson, Eve Blantyre, *Folk Lore in Lowland Scotland* (J. M. Dent & Co., London, 1908), p. 56. See also Dalyell, as cited in note 32, pp. 291–292. In order to impart local color moving pictures of plays in which there are Scotch weddings sometimes show the bride being carried over the threshold.

[179] References are given by Ogle, M. B., *Am. Journ. Phil.*, 32 (1911): 253: cf. p. 252.

[180] 2.358–359.

[181] See Gibbon, E., *The History of the Decline and Fall of the Roman Empire* (ed. J. B. Bury; Methuen & Co., London, 1909–14), 2: 18.

[182] Bergen, p. 61, No. 355: cf. Wuttke, p. 371: "Beim Kirchenthor muss die Braut mit dem rechten Fusse vorschreiten."

[183] Vitruvius 3.4.4. [184] Thomas and Thomas, p. 64, No. 620.

unlucky for such a ceremony.[185] A Scotch proverb [186] of long standing is:

Marry in May
Rue for aye.

This belief has the sanction of the ages. It was a Roman saying that women who married in May were bad wives: [187]

Hac quoque de causa, si te proverbia tangunt,
Mense malas Maio nubere vulgus ait.[188]

LOVE KNOTS

Among the many things to be included in the lore of binding are lover's knots and knots employed in love divination. There are all sorts of prescriptions about methods of using them. Those that follow are fairly representative.

Make a lover's knot of a handkerchief and pull the ends. The end that stays in most tightly shows the one that loves you the most.[189]

If you can tie the tying-vine into a lover's knot, you can get any one that you desire as [your] married partner.[190]

If you tie a knot in a cedar limb and name it and it grows, the person it is named for loves you.[191]

If your thread knots while you are sewing, name it for your sweetheart. If he loves you it will come untied.[192]

If your thread knots while you are making a garment, you will marry before it wears out.[193]

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[185] Thiselton-Dyer, T. F., *English Folk-Lore* [2] (D. Bogue, London, 1880), p. 187.

[186] Henderson, p. 34.

[187] Ovid, *Fasti* 5.489–490 (441–442). See J. G. Frazer's annotated edition (Macmillan and Co., London, 1929), 4: 52–57. In *Roman Questions*, 86, Plutarch asks why Romans do not marry in the month of May. See H. J. Rose's edition, p. 204.

[188] Much lore of marriage has been collected by Wood, E. J., *The Wedding Day in All Ages and Countries* (R. Bentley, London, 1869) and by Samter, E., *Geburt, Hochzeit und Tod* (B. G. Teubner, Leipzig and Berlin, 1911).

[189] Thomas and Thomas, p. 41, No. 381. Presumably the ends of the handkerchief are named.

[190] *Ibid.*, p. 61, No. 595.

[191] *Ibid.*, p. 31, No. 254.

[192] *Ibid.*, p. 59, No. 577.

[193] *Ibid.*, p. 59, No. 579.

Charms are sometimes used to assist love knots, as may be seen from part of a sonnet called *The Charm*, by Thomas Campion: [194]

> Thrice toss those oaken ashes in the air,
> And thrice three times tie up this true-love's knot,
> Thrice sit you down in this enchanted chair,
> And murmur soft "She will or she will not."

In antiquity, too, charms and love knots were combined, as we may see from a striking passage in one of Vergil's *Eclogues*.[195] In order to draw Daphnis home to her from the city, a lovesick maiden resorts to spells, and also winds around the image of her beloved three threads of different hues. She then leads the image around an altar while urging a shepherdess, Amaryllis, to make three love knots of the same three colors and to say: "I am weaving knots of Venus."

> It is not long since the highland sorcerer [of Scotland] endeavoured to wreak his malevolence, through the medium of three threads of different colours: and as if the precepts of Virgil had descended in Gaelic, he cast three knots on each, accompanied by as many imprecations.[196]

DOVES AS SYMBOLS OF CONJUGAL FIDELITY

Doves have always symbolized love [197] and conjugal fidelity. Shakespeare speaks of

> . . . turtles pair
> That never mean to part.[198]

In *Troilus and Cressida* [199] he is even more emphatic:

> As true as steel, as plantage to the moon,
> As sun to day, as turtle to her mate,
> As iron to adamant, as earth to the centre. : . .

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[194] The complete sonnet may be found in Schelling, F. E., *A Book of Elizabethan Lyrics* (Ginn and Co., Boston, 1895), p. 185.

[195] 8.73–79: cf. Theocr. 2.23–68.

[196] Dalyell, as cited in note 32, p. 306.

[197] See, for example, Thomas and Thomas, p. 36, Nos. 310–311.

[198] *The Winter's Tale*, IV.iii.154–155.

[199] III.ii.184–186.

Such ideas were commonplaces in antiquity.[200] Several writers say that turtle doves once mated are mated for life. In Egypt a black dove was a symbol of perpetual widowhood.[201]

PART III: GENERAL SUPERSTITIONS

In this section of my paper I shall try to restrict myself to superstitions that have to do with everyday life in general. In a later article I may return to the subject of survivals in order to list a number of beliefs connected with meteorology, farming, natural history and similar things.

DOG DAYS

Among my boyhood companions in Pennsylvania there were some who refused to go in swimming during the dog days. I did not follow their example, but it was with uneasy feelings that I disregarded their warnings. One was liable to get scabs and boils at this period. The Romans also looked upon dog days as unhealthful,[202] but I find no reference to scabs and boils.

As a boy I learned that dogs are most likely to become mad during dog days and that they are especially dangerous to man at this season. Pliny[203] says that "canine madness" (*rabies canum*), i.e. hydrophobia, is fatal to man during the heat of the Dog Star and mentions the horror of water experienced by those who are bitten.

The expression "dog days" is simply a translation of *dies caniculares*, which the Romans used to denote the time between the rising and setting of Canicula, "the little dog." Since this period was the hottest of the summer and brought high mortality, the Romans naturally blamed it on the dog.[204]

[200] References have been collected by Thompson, D. W., *A Glossary of Greek Birds* (Clarendon Press, Oxford, 1895), pp. 141–142.

[201] Horapoll. 2.32. An important reference on superstitions of love is Dedo, Ricardus, *De Antiquorum Superstitione Amatoria*, Dissertatio inauguralis . . . in Universitate Gryphiensi, 1904.

[202] Pliny 18.272.

[203] 8.152.

[204] See Scholia Strozziana on *Germanici Caesaris Aratea* (ed. Breysig, Teubner, 1867), p. 167: "Sirius stella est in medio centro caeli ad quam cum

CUTTING HAIR BY THE MOON

In a book on contemporary superstitions there is the following direction: "To make hair grow, cut it in the new of the moon." [205] The same source says that "It is the custom for girls to cut their bangs on the forehead when the moon is new. This custom is observed by many intelligent young people." [206] I regarded this item of folklore as uncommon until an old lady told me that her mother used to trim her hair in the waxing of the moon. Things came a little nearer home when a cousin informed me that a hairdresser had urged her to observe this practice. Recently one of my sisters received the same admonition.

Like death, this superstition has beaten at the doors of both hovels and palaces. The Emporor Tiberius had his hair cut at the end of the dark of the moon,[207] so that it would lose no time as the moon began to grow.

There was danger not merely that hair would not grow if cut in the waning moon, but that one would become bald.[208] There were exceptions to the custom of cutting hair during the waxing moon. We are told that persons who wished to live holy lives did not observe it.[209]

RIGHT AND LEFT

I have already quoted superstitions about the right foot (p. 136). There are still others worth mentioning.

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sol ascenderit duplicatur calor ipsius et languore afficiuntur corpora." See also *Class. Weekly*, 20 : 51–52; Gundel, G., "De Stellarum Appellatione et Religione Romana," *Religionsgeschichtliche Versuche und Vorarbeiten*, 3 (1907) : 132–139; *The Works of Sir Thomas Browne*, as cited in note 114, 3 : 72–88.

[205] Bergen, p. 122, No. 1131. A negative version of the superstition is given in *Journ. of Am. Folk-Lore*, 4 (1891) : 120: "Never cut your hair in the decrease of the moon."

[206] Bergen, p. 122, No. 1133. See also Wuttke, p. 161.

[207] Pliny 16.194: "Tiberius item et in capillo tondendo servavit interlunia."

[208] Varro, *Res Rust.* 1.37,2.

[209] Olympiodorus, *In Platonis Alcibiadem Commentarii*, p. 18 (ed. F. Creuzer, 1821). Many interesting examples of planting seeds and harvesting crops according to the phases of the moon are to be found in a paper by Tavenner, E., "The Roman Farmer and the Moon," *Trans. and Proc. of Am. Phil. Assn.*, 49 (1918) : 67–82.

We speak of putting the best foot forward.[210] I notice that Shakespeare is both physically and grammatically precise when he wishes to express this idea, for he says: "Come on, my lords, the better foot before";[211] "Nay, but make haste; the better foot before."[212] He uses the comparative form and says "before" instead of "first."

There is a Kentucky belief that "It is well to step into a court room on your right foot when you have business there."[213] Another superstition warns to "Be particular to put your right foot foremost when you leave the house, or ill luck will betide you."[214]

Perhaps the most interesting literary passage on this superstition is in Boswell's *Life of Johnson:*[215]

> He had another particularity, of which none of his friends ever ventured to ask an explanation. It appeared to me some superstitious habit, which he had contracted early, and from which he had never called upon his reason to disentangle him. This was his anxious care to go out or in at a door or passage by a certain number of steps from a certain point, or at least so as that either his right or his left foot, (I am not certain which,[216]) should constantly make the first actual movement when he came close to the door or passage. Thus I conjecture: for I have, upon innumerable occasions, observed him suddenly stop, and then seem to count his steps with a deep earnestness; and when he had neglected or gone wrong in this sort of magical movement, I have seen him go back again, put himself in a proper posture to begin the ceremony, and, having gone through it, break from his abstraction, walk briskly on, and join his companion.

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[210] In November, 1930, *The American Magazine* contained an article called "Do You Ever Get Off with the Wrong Foot?"

[211] *Titus Andronicus*, II.iii.192.

[212] *King John*, IV.ii.170.

[213] Thomas and Thomas, p. 89, No. 1001.

[214] Johnson, C., *What They Say in New England* (Lee and Shepard, Boston, 1897), p. 93.

[215] This passage occurs almost at the end of the entries under the year 1764.

[216] There can be no doubt that it was the right foot. Cf. Henderson, p. 116: "Again, if you enter another man's house with your 'skir' [left] foot foremost, you draw down evil on its inhabitants. If, therefore, you have carelessly done so, you must avert the mischief by going out, and making your entrance with the right foot foremost. I conclude that this little superstition once held its ground in the South, for Dr. Johnson is said to have entertained it, and to have left a house and re-entered it right foot foremost, if on the first occasion he had planted his left foot on the threshold."

Such ideas are not new. The Romans called the right foot "the favorable foot," [217] "the auspicious foot," [218] "the fortunate foot." [219] In fact, the phrase "*pede dextro* came to be used for any action begun or performed under favorable auspices." [220] At the dining-room of the rake Trimalchio a slave greeted the guests with the warning "*dextro pede.*" [221]

The right foot was likewise the one with which to begin a journey.[222] Leaving the house with the left foot first was a sign of calamities.[223] It might also cause one's business projects to go awry.[224]

We have seen how careful Dr. Johnson was always to go into a house with the same foot first. In Apuleius even the entry of a beast into a house with the worst foot first is regarded as the cause of many woes.[225]

"In dressing for a journey, if you wish to have good luck, dress the right foot first." [226] "To clothe the left foot before the right one is a sign of misfortune." [227] How old are these superstitions? According to Pythagoras, the right shoe should be put on first.[228] Augustus considered it a bad omen to make a mistake in the order,[229] for on one day when he did so he came near being over-

[217] "Pede . . . secundo," Verg., *Aeneid* 8.302; 10.255.

[218] "Pede fausto," Hor., *Epist.* 2.2.37.

[219] "Felici . . . pede," Ovid, *Fasti* 1.514 (464).

[220] Wagener, A. P., *Popular Associations of Right and Left in Roman Literature* (J. H. Furst Co., Baltimore, 1912), p. 42. An excellent example of such superstitions is to be found in Pliny 30.85: "Aliud est cuculo miraculum: quo quis loco primum audiat alitem illam, si dexter pes circumscribatur ac vestigium id effodiatur, non gigni pulices ubicumque spargatur."

[221] Petronius 30. See also Iambl., *De Vita Pythag.* 28.156.

[222] See Juvenal 10.5: cf. Suidas, *s.v.* *πρώτῳ ποδί.* *ὃ οἰωνιζόμενοι λέγειν εἰώθασι.* Interesting references are Mayor, J. E. B., on Juvenal 10.5; Ogle, M. B., in *Am. Journ. Phil.*, 32 (1911) : 254, note 2.

[223] St. Chrysostom, *In Epist. ad Ephes. Cap. IV, Homil. XII*, § 3 (Migne, *Patrol. Graec.*, Vol. 62, Col. 92).

[224] Apul., *Met.* 1.5: "Sed, ut fieri assolet, sinistro pede profectum me spes compendii frustrata; omne enim pridie Lupus negotiator magnarius coemerat."

[225] *Met.* 6.26: "Quid quod et pessimo pede domum nostrum accessit, nec quicquam idonei lucri exinde cepimus sed vulnera et fortissimorum occisiones."

[226] Bergen, p. 142, No. 1385.

[227] *Ibid.*, p. 80, No. 626. See also Thomas and Thomas, p. 89, No. 1000; p. 168, Nos. 2131, 2133; *Folk-Lore Record*, 1 (1878) : 12.

[228] Iambl., *De Vita Pythag.* 18.83. [229] Suet., *Aug.* 92.

whelmed by a revolt.[230] Ill betide the servant who made a mistake in handing the left shoe first to his master.[231]

In some parts of our country it is unlucky to bait a hook with the left hand [232] and there are other evil associations connected with this hand.[233] Our word "sinister" is derived from the Latin word for "left," or "left hand," to which ill luck was attributed because omens on the left were in general unfavorable. If a charioteer in a procession first took hold of the reins with his left hand the procession had to be started over again.[234]

BURNING OF THE EARS

Our superstition that the tingling or burning of the ears indicates that someone is talking about us is very old. An example of it may be found in Chaucer, *Troilus and Criseyde:* [235]

> Rid forth thi wey, and hold thi governaunce;
> And we shal speke of the somwhat, I trowe,
> Whan thow art gon, to don thyn eris glowe.

Today the burning of the right ear means that someone is speaking well of us; of the left ear, ill.[236] Passages in classical authors [237]

[230] Pliny 2.24: "Divus Augustus prodidit laevum sibi calceum praepostere inductum quo die seditione militari prope adflictus est."

[231] St. Chrysostom, *In Epist. ad Ephes. Cap. IV, Homil. XII*, § 3 (Migne, *Patrol. Graec.*, Vol. 62, Col. 92): "Nunc servus exsecrandus dans mihi calceos, primum porrexit partem sinistram; graves significantur calamitates et contumeliae."

[232] Thomas and Thomas, p. 85, No. 927.

[233] *Ibid.*, Nos. 928–931.

[234] Plut., *Coriolanus* 25.5.

[235] Book 2, lines 1020–1022.

[236] *Journ. of Am. Folk-Lore*, 4 (1891) : 120; Henderson, p. 113; Bergen, p. 139, No. 1344: cf. Nos. 1345-1347. See also the Bohn edition of Pliny, 5 : 284; Wuttke, p. 218.

[237] Lucian, *Dial. Meretr.* 9.40: cf. Aristaen., *Epist.* 2.13: οὐκ ἐβόμβει σοι τὰ ὦτα ὅτε σου μετὰ δακρύων ἐμεμνήμην; Pliny 28.24: "Quin et absentes tinnitu aurium praesentire sermones de se receptum est"; Apul., *Apol.* 48: ". . . ecquid illi aures obtinnerent." A curious little poem called *De Tinnitu Auris*, of which I quote four verses, is to be found in Baehrens, A., *Anthol. Lat.*, No. 62 (*Poetae Latini Minores* [B. G. Teubner, Leipzig, 1879–82] 4 : 81):

> "Garrula quod totis resonas mihi noctibus, auris
> Nescio quem dicis nunc meminisse mei.
> 'Hic quis sit, quaeris? resonant tibi noctibus aures
> Et resonant totis: Delia te loquitur.'"

do not differentiate between the ears, but in some places in modern Greece our interpretation is reversed.[238]

THE CHEEKS AND MODESTY

The cheeks, too, have received some attention in popular lore. Poets especially are fond of associating them with modesty. A good example is to be found in Cowper's *Expostulation:* [239]

> Forget the blush that virgin fears impart
> To modest cheeks. . . .

Shakespeare [240] employs the same idea much more effectively:

> I should make very forges of my cheeks,
> That would to cinders burn up modesty,
> Did I but speak thy deeds.[241]

The association of the cheeks with modesty is very natural, but it is not even relatively new, for Pliny [242] calls them the seat of modesty and explains that this part of the body most frequently manifests the redness of blushing.

BLISTERS ON THE TONGUE

The tongue also has some folklore associations. "If you get a blister on your tongue somebody is lying about you or slandering you; if you then throw salt on the fire crosswise, that person will bite his or her tongue." [243] A Louisiana version of this superstition is a little different: "If you have a sore on the tip of the tongue,

[238] Abbott, as cited in note 51, p. 111.

[239] Lines 47–48.

[240] *Othello,* IV.ii.73–75.

[241] Cf. the following quotation from "Canon's Yeoman's Tale" in Chaucer, *The Canterbury Tales:*

> "Evere whan I speke of his falshede,
> For shame of hym my chekes wexen rede, —
> Algates they bigynnen for to glowe. . . ."

[242] 11.157: "Pudoris haec (malae) sedes; ibi maxime ostenditur rubor."

[243] *Encyclopaedia of Superstitions, Folklore, and the Occult Sciences,* 1: 349.

it is a sign that you have lied." [244] A closely parallel idea was used by John Gay in *The Shepherd's Week:* [245]

> Woe worth thy tongue! may blisters sore it gall,
> That names Buxoma, Blouzelind withal.
>
> Hold, witless Lobbin Clout, I thee advise,
> Lest blisters on thy own tongue arise.

According to a Latin source, a person afflicted with a blister on the tongue was to touch it with the outer edge of his tunic and say three times: "So far away be he who is slandering me." An added injunction was to spit on the ground after each repetition of the words.[246] This superstition is the same as the first of the current beliefs I have cited, but the methods of cure are far different.

SHARING GOOD LUCK BY TOUCHING

The efficacy of touching is, of course, not confined to healing. In the fall of 1930 it was reported that spectators hastened to touch the victors in the world's championship baseball series. Another example may be cited from the field of athletics: [247] "A newspaper clipping of December 3, 1920, reports that just prior to examinations in a large eastern university students playfully touched the captain of a football team, who had won the toss in all the games of the preceding fall." [248]

Ancient parallels could be cited almost endlessly, but I shall give only one example. "On one occasion when Sulla was watching a gladiatorial spectacle, there was sitting near him a woman of noble birth and great beauty, who was a divorcee. She rose and

[244] Saxon, Lyle, *Old Louisiana* (The Century Co., New York, 1929), p. 347. See also Thomas and Thomas, p. 80, No. 854; *Journ. of Am. Folk-Lore*, 40 (1927): 161, No. 275; Bergen, p. 37, No. 163: "A lump (enlarged papilla) on the tongue is a sign one has told a lie"; *The Folk-Lorist*, 1 (1892): 61: "If your tongue is sore, it is because you have spoken evil of some one." Leprosy was inflicted upon Miriam for slandering her brother Moses. See Numbers xiii.1, 10.

[245] "Monday," lines 17–20.

[246] Marcell. Empir. 11.25: cf. Theocr. 9.30; 12.24.

[247] See p. 130 of article cited in note 249.

[248] It would be very easy, of course, to cite more serious examples from modern times.

passed behind him, at the same time resting her hand upon him and plucking a bit of nap from his mantle. When Sulla gazed at her in bewilderment, she exclaimed: 'It's nothing of consequence, dictator, but I too wish a share of thy felicity.' " [249] One recalls in this connection the woman who wished to touch the hem of Christ's garment.

STEPPING OVER A BROOM

Every man's house may be his castle, but nevertheless danger lurks within, for superstition has free ingress when perils in other forms are barred. According to a modern belief, if a girl steps over a broom she will be an old maid.[250]

In some parts of Bavaria, housemaids, in sweeping out the house, are careful not to step over the broom for fear of the witches. Again, it is a Bavarian rule not to step over a broom while a confinement is taking place in a house; otherwise the birth will be tedious, and the child will always remain small with a large head. But if anyone has stepped over a broom inadvertently, he can undo the spell by stepping backwards over it again. So in Bombay they say you should never step across a broom, or you will cause a woman to suffer severely in childbed.[251]

The superstition that stepping over a broom causes ill luck is old as well as widespread, since it existed among the Greeks. Pythagoras warned his followers against stepping over this useful but dangerous object.[252]

SPILLING SALT

Another common household superstition in both this country and England is that it is unlucky to spill salt.[253] It may even help

[249] Quoted from McCartney, E. S., "The 'Wooden Horse' and Folk-Lore of Touching," *Class. Journ.*, 21 (1925) : 112–131.

[250] Bergen, p. 62, No. 367.

[251] Frazer, J. G., "Some Popular Superstitions of the Ancients," *Folk-Lore*, 1 (1890) : 157.

[252] Hippol., *Philosophumena sive Omnium Haereseon Refutatio* 6.27: Σάρον μὴ ὑπέρβαινε. This is the reading in Migne, *Patrol. Graec.*, Vol. 16, Part 3, Col. 3234. Hippolytus is the author, but in Migne the work is ascribed to Origen.

[253] *Folk-Lore Record*, 1 (1878) : 12; Bergen, p. 82, Nos. 645–649; Thomas and Thomas, p. 148, Nos. 1809–1813.

to cause death. John Gay [254] puts the following words in the mouth of a woman who had lost her husband:

> Alas! you know the cause too well;
> The salt is spilt, to me it fell. . . .

In more recent times Huck Finn was worried because of a similar accident: [255]

> One morning I happened to turn over the saltcellar at breakfast. I reached for some of it as quick as I could to throw over my left shoulder and keep off the bad luck, but Miss Watson was in ahead of me, and crossed me off. She says, "Take your hands away, Huckleberry; what a mess you are always making!" The widow put in a good word for me, but that warn't going to keep off the bad luck, I knowed that well enough. I started out, after breakfast, feeling worried and shaky, and wondering where it was going to fall on me, and what it was going to be. There is ways to keep off some kinds of bad luck, but this wasn't one of them kind; so I never tried to do anything, but just poked along low-spirited and on the watch-out.

The belief that it is unlucky to spill salt is old, since it existed among the Romans.[256]

TURNING BACK

It is unlucky to turn back after starting to go anywhere. To avert misfortune after turning back, make the sign of the cross in the dust with the heel, and spit in the cross.[257]

Some people who get started, and then think of something they've forgot before they've got out of sight and hearing of the house, will stand right there and holler half an hour for some one to fetch it, rather than go back.[258]

One of my grandmothers prescribed sitting down and counting nine if one did have to return.

Among the maxims of Pythagoras there is a warning not

[254] *The Farmer's Wife and the Raven*, Fable 37.

[255] Mark Twain, *The Adventures of Huckleberry Finn*, Chap. 4.

[256] I am taking this information at second hand from *Folk-Lore Record* 1 (1878) : 12, which, unfortunately, does not cite the original source. Leland, C. G., *Etruscan Roman Remains in Popular Tradition* (C. Scribner's Sons, New York, 1892), p. 12, says that the Romans exclaimed "Dii avertite omen" when they spilled salt, but he is equally exasperating in failing to mention his source. The superstition survives in Sicily. See Pitrè, G., *Biblioteca delle tradizioni popolari siciliane* (Palermo, 1891–1913), 17 : 144.

[257] Bergen, p. 134, No. 1272. See also p. 83, Nos. 656–662; Bergen, *Animal and Plant Lore*, p. 17, No. 83; Frazer, J. G., *Folk-Lore*, 1 (1890) : 155.

[258] Johnson, as cited in note 214, pp. 89–90.

to turn back after setting out from the house. If a person did so the Furies would catch him.[259] The fate of Eurydice when Orpheus looked back on the return trip from Hades is familiar to everyone.[260]

It seems that anything which breaks the orderly progress of an undertaking is regarded as bad luck. Interruptions of formulas, rituals and ceremonies are ominous. It is good psychology for one who has put his hand to the plow not to turn back.

CHANCE ENCOUNTERS WITH ANIMALS

Upon the journey itself and even when one is abroad in pursuit of either pleasure or business, chance encounters with animals may be fraught with danger. Everyone knows of the Negro's dread of meeting a black cat, though white people, too, fear this animal.[261] An old superstition says that "To start on a journey and see a white mule is bad luck." [262] To avert the bad luck attendant upon meeting a rabbit the traveler must go back and start over.[263] "If a rabbit crosses your path from right to left, be careful not to walk in the dark for three days." [264] There are still other complications from such an encounter.[265]

A superstition that was doubtless familiar to the youthful Lincoln is pertinent in this connection: "A dog crossing a hunter's path means bad luck unless he hooks his two little fingers together and pulls till the dog is out of sight." [266]

[259] Iambl., *Protrep.* 21. Other references are given by Frazer as cited in note 257.

[260] Much curious lore on turning back and voluminous references to it have been collected by Pease, A. S., on Cicero, *De Divinatione* 1.49 (as cited in note 90).

[261] Thomas and Thomas, p. 31, No. 253; p. 74, No. 762; pp. 245–246, Nos. 3268–3276; p. 245, No. 3281.

[262] Sandburg, Carl, *Abraham Lincoln, The Prairie Years* (Harcourt, Brace and Co., New York, 1926), 1 : 67.

[263] Thomas and Thomas, p. 257, No. 3460.

[264] *Ibid.*, No. 3462.

[265] See *ibid.*, Nos. 3459, 3461, 3463 3467. See also Sébillot, P., as cited in note 110, 3 : 98–100.

[266] Sandburg, Carl, *Abe Lincoln Grows Up* (Harcourt, Brace and Co., New York, 1926), p. 125.

The raven, which frequently finds its way into good literature, may likewise portend ill from a chance meeting:

> "That Raven on yon' left-hand oak
> (Curse on his ill-betiding croak!)
> Bodes me no good." [267] No more she said,
> When poor blind Ball, with stumbling tread,
> Fell prone; o'erturn'd the pannier lay,
> And her mash'd eggs bestrow'd the way.[268]

Another ominous animal is the weasel. Fear of meeting it is widespread in Europe today, doubtless because of the traditional dread of such an encounter among the Greeks and Romans.[269] Pythagoras is said to have recommended turning back when a weasel crossed one's path.[270] A weasel darting through the crowd as Sejanus left his home in 31 A.D. boded no good for him.[271] Aristophanes has his joke at the expense of people who would be frightened into inactivity were a weasel to cross their paths.[272]

Seneca tells us that there is no living creature whose movement on meeting persons does not foretell something [273] and in Xenophon,[274] too, there are generalizations about meeting animals. Such ideas must have been prevalent throughout the ancient world, for the Chaldeans drew great numbers of omens from chance encounters with animals.[275]

THE RABBIT'S FOOT AND GOOD LUCK

One of our common superstitions attaches luck to the carrying of a rabbit's foot. On July 21, 1923, a university daily paper

[267] One wonders whether there is here an indebtedness to Vergil, *Ecl.* 9.15: "Ante sinistra cava monuisset ab ilice cornix."

[268] Gay, John, *The Farmer's Wife and the Raven*, Fable 37.

[269] See Duncan, T. S., "The Weasel in Religion, Myth and Superstition," *Washington University Studies, Humanistic Series*, 12 : 33–66. See also Frazer, J. G., *Folk-Lore*, 1 (1890) : 156.

[270] *Frag. Phil. Graec.*, ed. Mullach, Vol. 1, p. 510.

[271] Dio Cassius 58.5.5. [272] *Eccles.* 792. [273] *Nat. Quaest.* 2.32.6.

[274] See *Apol. Soc.* 13, where *σύμβολοι*, "chance encounters," are mentioned. See also *Mem.* 1.1.3.

[275] Lenormant, F., *La Divination et la science des présages chez les Chaldéens* (Maisonneuve et Cie., Paris, 1875), pp. 96–97. Mice, locusts and lions were especially significant in the ominology of the Babylonians. See Photion, *Bibl.*, cod. 94 (p. 75 of I. Bekker's edition, Berlin, 1824).

quoted the director of a university health service as follows: "The number of lucky teeth and rabbit feet that are used [by students of the university] is astonishing." In the fall of 1930 the same paper reported that the captain of the football team wore a rabbit's foot into action.

A rabbit's foot is much more reliable if certain conditions are fulfilled in getting it: "You will have good luck if you wear the left hind foot of a graveyard rabbit, shot by a red-headed, cross-eyed negro in the dark of the moon." [276]

There are still other specifications for rabbits' feet. Under date of January 20, 1664, Samuel Pepys explains how he learned why his hare's foot, which had no joint, failed to work. A friend had one with a joint and "he never had his cholique since he carried it about with him: and it is a strange thing how fancy works, for I no sooner handled his foot but I became very well and so continue."

Among the Romans, too, the foot of the hare was in common use as an amulet. It would avert pains in the stomach, for instance.[277] The ancients found ways to intensify the remedial powers inherent in a rabbit's foot: [278] "Cut off the foot of a live rabbit and pluck hairs from its belly and let it go while still alive. From the hairs or "wool" [279] make a strong thread and tie it to the rabbit's foot and bind it about the patient's body; you will find it a wonderful cure. The remedy will be more effective, however, in fact incredible, if by chance you find the bone itself, i.e. the ankle-bone, in the dung of a wolf; you should guard the

[276] Thomas and Thomas, p. 257, No. 3468. See also Nos. 3469–3473, and Bergen, as cited in note 43, pp. 125–126. There are four communications on "Rabbits'-Foot Lore" in *The Folk-Lorist*, 1 (1892) : 169. For European superstitions concerning the hare see Hazlitt, as cited in note 50, 1 : 305.

[277] Pliny 28.199: "Ventris quidem dolore temptari negant talum leporis habentes"; Marcell. Empir. 28.48: "Si quis talum leporis secum habuerit, immunis a dolore ventris et periculo huiusmodi perpetuo permanebit"; *idem*, 27.84: "sed qui talum leporis secum habuerit, huiusmodi casum, id est subitum dolorem ventris, numquam incurret." See also Pliny 26.220; Marcell. Empir. 28.21; 36.26 28. For these references I am indebted to E. Tavenner, as cited in note 433, pp. 87–88.

[278] Marcell. Empir. 29.35.

[279] Marcellus uses the word *lana*, "wool," but the word *vel* before it seems to be quasi-apologetic.

bone so that it neither touches ground nor is touched by a woman. No woman should touch that thread made of the rabbit's wool."

NUMBERS AND LUCK

"The belief in 'luck in odd numbers' is frequently expressed and acted upon." [280] Perhaps the most effective literary use of the superstition is to be found in Shakespeare, who puts these words into the mouth of Falstaff: [281] "This is the third time; I hope good luck lies in odd numbers. . . . They say there is divinity in odd numbers, either in nativity, chance, or death." There is nothing in this that is original with Shakespeare except the phrasing. The idea was old when Vergil wrote: [282] "The god delights in uneven numbers."

Even German fairy stories are just as sure of the efficacy of the number three, for in them "Aller guten Dinge sind drei." [283] Italian lore is equally specific. In 1915 I bought two amulets in a store at Palermo. The salesman told me that I should have three. That was good business, but I realized the wisdom of his suggestion and got another. I have a group of thirteen Italian amulets attached to a ring. They are supposed to be especially effective. It would seem that the saying, "There is safety in numbers," is only half true; in fact, it is slightly less than half true when thirteen is regarded as unlucky.[284]

Students of history will recall that the Peloponnesian War was to last thrice nine years,[285] but a more interesting example of belief in the efficacy of numbers is to be found in Roman history. In an effort to appease the gods after Hannibal's overwhelming victories the Romans in 217 B.C. vowed games which were to cost 333,333$\frac{1}{3}$ bronze pieces.[286]

[280] Cox, p. 22.

[281] *The Merry Wives of Windsor*, V.i.2–5.

[282] *Ecl.* 8.76: cf. Pliny 28.23: "Cur impares numeros ad omnia vehementiores credimus . . .?"

[283] *Kinder- und Hausmärchen* of the Grimm brothers, Nos. 2, 36, according to the numbering of the edition cited in note 107.

[284] See Postgate, J. P., "Uncanny Thirteen," *Class. Rev.*, 19 (1905): 437–438; "More Uncanny Thirteens," *ibid.*, 20 (1906): 443.

[285] Thuc. 5.26.4; Plut., *Nicias* 9.6.

[286] Livy 22.10.7.

In *The Evil Eye* [287] Elworthy states that "A sitting of eggs is a number just as well known as a baker's dozen — thirteen." It is stated by Pliny the Elder [288] that during the summer months and till the Calends of November a hen should have thirteen eggs in a sitting.[289]

BOASTFUL SPEECH

Very closely related in spirit to the lore of overpraising, which we have seen is so dangerous to infants, is the lore of boasting, generally an accomplishment of more mature years.

We warn against Nemesis by saying "Don't boast." In *Scarlet Sister Mary* [290] one Negress is afraid that another may draw down the anger of God and thus admonishes her: "Mind how you brag, Si May-e."

> Even the most enlightened of us has constantly heard and perhaps said: "I never like to boast of my things; if I do I am sure to lose them." "Only yesterday, I was saying I had not broken anything for years, and now I have let fall that old glass that belonged to my grandmother!"

An incident that occurred in England is thus described by Elworthy in *The Evil Eye:* [291]

> A few weeks ago a respectable farmer had a very nice-looking horse in his cart, which the writer, his landlord, admired, and said would bring him a long price for a certain purpose. The owner began to expatiate on the good qualities of the animal, but suddenly stopped and said: "But there, I don't want to zell'n, and mustn' zay too much for fear o' bad luck."

A spiritual brother to our "Don't boast" and "Mind how you brag" is to be found in one of the letters of Pliny the Younger,[292]

[287] P. 406, but compare Henderson, p. 112, where the emphasis is on an uneven number of eggs.

[288] 18.231.

[289] I have given many references to the literature of numerology in the footnotes to an article on "Folklore of Number in Pliny's Natural History," *Phil. Quart.*, 2 (1923) : 26–37. For an interesting example of 9,999 as a magical number on a "gnostic" stone see Bonner, Campbell, "The Numerical Value of a Magical Formula," *Journ. of Egypt. Arch.*, 16 (1930) : 6–9. Perhaps the most recent contribution to ancient lore of number is that by Thackeray, H. St. John, "Sophocles and the Perfect Number: a Neglected Study," *Proceedings of the British Academy*, Vol. 16.

[290] Peterkin, Julia, *Scarlet Sister Mary* (Grosset & Dunlap; copyright by the Bobbs-Merrill Co., Indianapolis, 1928), p. 261.

[291] P. 13. [292] *Epist.* 5.6.

who writes most enthusiastically about the climate of his Tuscan villa. He is enjoying excellent health and is exercising his mind by study and his body by hunting. His large household too is happy. In fact, he has not lost a single member of it. Then he concludes: "Pardon my saying so." [293]

The following passage from Apuleius [294] contains a somewhat similar expression: "To meet with the favor of the people, to please the senate, to gain the approval of officers and leaders, that — I would speak without bewitchment [295] — in some measure has already been my good lot."

In Plato's *Phaedo* [296] there is an exhortation not to talk big lest someone by the evil eye should put to flight the word about to be uttered. The Greek proverb, "You spit upon your breast," is a method of calling a man a braggart, since the dangers of boasting were avoided by this means.[297] Another Greek proverb, "He does not spit upon his breast," is likewise used to signify a boaster,[298] presumably one who omits the safeguard.[299]

[293] "Venia sit dicto."

[294] *Flor.* 16: "Gratum esse populo, placere ordini, probari magistratibus et principibus, id — praefiscine dixerim — iam quodam modo mihi obtigit."

[295] Cf. Titin. ap. Charis., 1 : 212 (in Keil, *Grammatici Latini*):

> "Paula mea, amabo. Pol tu ad laudem addito
> Praefiscini."

To this quotation Charisius adds the comment: "ne puella fascinetur." Equally interesting is a passage from Plautus, *Asin.* 491–493:

> "Praefiscini hoc nunc dixerim: nemo etiam me accusavit
> Merito meo, neque me alter est Athenis hodie quisquam
> Quoi credi recte aeque putent."

Other references are to be found in *Harpers' Latin Dictionary*, *s.v. Praefiscini*.

[296] 95 B: *μὴ μέγα λέγε μή τις ἡμῶν βασκανίᾳ περιτρέψῃ τὸν λόγον τὸν μέλλοντα λέγεσθαι.* It is generally Zeus, however, who punishes overweening mortals. See Aesch., *Pers.* 820, 827–828. Reference may be made here to one of my own notes, "Boasting as a Provocation of the Divine Powers," *Class. Journ.*, 19 (1924) : 382–383. Interesting examples are given by Abbott, p. 145.

[297] Leutsch, E. L., et Schneidewin, F. G., *Corpus Paroemiographorum Graecorum*, Vol. 2, p. 112.

[298] *Ibid.*, Vol. 1, p. 245: cf. Lucian, *Navigium seu Vota* 15: *ὑπερμαζᾷς γε, ὦ Ἀδείμαντε, καὶ ἐς τὸν κόλπον οὐ πτύεις.*

[299] On spitting as a prophylactic see Maclagan, pp. 126–128; *Harvard Studies in Class. Phil.*, 8 (1897) : 38–39.

PRIDE GOETH BEFORE A FALL

Another example of the danger of vanity is afforded by Gregory of Tours, who tells how he was once saved from a storm by the use of relics. He was much elated by his success, but his jubilation did not last long, for his horse slipped and threw him to the ground so heavily that he arose with difficulty. In commenting on the occurrence he says: "I know that this befell me because of my pride, and thereafter it was enough for me to be on my guard that the prick of false vanity should not goad me on." [300]

In this example pride precedes a literal rather than a figurative fall. Perhaps the expression "Pride goeth before a fall" had its origin in a literal fall.

NEMESIS IN HIGH PLACES

During the presidency of Calvin Coolidge his son, Calvin junior, died of blood-poisoning that resulted from a blister caused by playing tennis "in the South Grounds." In writing of this sad occurrence in his autobiography the former president says: [301] "When he went the power and the glory of the Presidency went with him. The ways of Providence are often beyond our understanding." * * * "I do not know why such a price was exacted for occupying the White House." A few paragraphs later he comments: "It costs a great deal to be President."

It will be recalled that not long before the lamented death of Calvin junior President Harding had died, though he was away from Washington at the time. When Calvin died a neighbor of mine remarked that she would not live in the White House under any circumstances.

Similar ideas are expressed in Sir Edward Peyton's *The Divine Catastrophe of the Kingly Family of the House of Stuarts*,[302] which

[300] Gregory, *De Gloria Martyrum*, Liber I, Caput 84, *ad finem* (Migne, *Patrol. Lat.*, Vol. 71, Cols. 780–781).

[301] *The Autobiography of Calvin Coolidge* (Cosmopolitan Book Corporation, New York, 1929), p. 190.

[302] T. Warner, London, 1731. This work was edited by Sir Walter Scott in *Secret History of the Court of King James the First* (Edinburgh, 1811), 2 : 301–466.

was written to prove that the fate of these unfortunate kings was due to the vengeance of heaven, after it had raised them to their eminence.

In antiquity there existed the same feeling about holding high office, as is shown by the experience of Aemilius Paulus, the conqueror of Perseus, amid the exaltation of achievement and triumph. Of him Appian writes: [303]

> Heaven was jealous of the prosperity of Paulus when he had reached such a pinnacle of fortune. Of his four sons . . . the two younger ones died, one of them three days before his triumph and the other five days after it. Paulus alluded to this as much as anything else in his address to the people. When he came to the Forum to give an account of his doings, according to the custom of generals, he said, "I sailed from Brundisium to Corcyra in one day. Five days I was on the road from Corcyra to Delphi, where I sacrificed to the god. In five days more I arrived in Thessaly and took command of the army. Fifteen days later I overthrew Perseus and conquered Macedonia. All these strokes of good fortune coming so rapidly led me to fear the approach of some calamity to the army on my return. When the army was made safe, I feared for you on account of the enviousness of fate. Now that the calamity falls upon me, in the sudden loss of my two sons, I am the most unfortunate of men for myself, but free from anxiety as to you."

Providence is playing the part of Nemesis in other walks of modern life. In *The Story of Kennett* [304] Bayard Taylor makes the bride-to-be say:

> "Please, Gilbert, don't always talk so certainly of what isn't over and settled! It makes me fearsome, so to take Providence for granted beforehand. I don't think the Lord likes it, for I've noticed that it brings disappointment; and I'd rather be humble and submissive in heart, the better to deserve our good fortune when it comes."

Aemilius Paulus, too, tried to restrain others. After the battle of Pydna he was quick to curb by vigorous words, "as with a bridle," the vaingloriousness and pride of his men.[305]

A close parallel to the passage in *The Story of Kennett* is to be found in Curtius.[306] At the battle of Arbela, Sisygambis, the mother of Darius, who had been a captive in the Macedonian

[303] *Romana Historia* 9.19 (translation by H. White in The Loeb Classical Library). See also Plut., *Aem. Paul.* 36; Livy 45.41.

[304] Chap. 17.

[305] Plut., *Aem. Paul.* 27.4.

[306] 4.15.10–11.

army since the battle of Issus, was told by her attendants, after a local success of the Persians, that Darius had conquered, that many of the enemy had been cut down, and that the victorious Persians had scattered for plunder. Neither speaking a word nor changing her expression, she remained impassive, although her fellow-captives tried to rouse her from her grief. Curtius attributes her conduct to a fear of vexing Fortune by "premature joy." [307]

OTHER WORKINGS OF NEMESIS

Danger lies in great possessions also. Superstitious people believe that it is possible to have "too much of a good thing." In describing the jewels and other wedding gifts showered upon a president's daughter, about which exaggerated stories had been spread, the author (or authoress?) of *Boudoir Mirrors of Washington* [308] tells us that the bride-elect was asked to give from her plenitude to various worthy causes and that some individuals made personal requests for duplications among the presents. In addition, "A few anonymous epistles were sent with a hint of future peril, should she retain this abundance which had been thrust into her hands."

Anyone familiar with Greek and Latin literature can cite, or at least readily find, instance after instance of the belief that dangers attend wealth, prosperity and success. Familiar to all is the story that Polycrates threw a beautiful seal ring into the sea in an effort to avert the danger menacing him because of his amazingly good fortune, but his doom became inevitable when the ring came back to him in the body of a fine fish which was served to him.[309]

Among the arguments which Artabanus advanced to Xerxes

[307] Under the caption "Nemesis in High Places" I have used, with some modification in phraseology and arrangement, material which appeared in a note on "Providence as a Successor to Nemesis," *Class. Weekly*, 25 (1931) : 47.

[308] P. 32 (J. C. Winston Co., Phila., 1923).

[309] Herod. 3.39–43; Pliny 37.3–4. I have taken most of the last two paragraphs from one of my own notes, "A Modern Illustration of the Belief in Nemesis," *Class. Journ.*, 20 (1925) : 365. The authorship of the note was wrongly ascribed to someone else.

PLATE X

A mosaic in the Museo Nazionale, Rome. It once formed the floor of a small tomb to the west of the Via Appia

against the invasion of Greece was the very general one that the desire for many possessions is a source of evil.[310]

Commencement speakers often give to graduating classes the advice: "Know thyself," meaning, "Know thy capacities." In antiquity, however, a very common meaning of this expression is: "Know thy limitations: know that thou art but a man and do not presume to rival the gods." [311] One of the routine duties of the gods was to see that man remained humble and avoided presumption. Sometimes an artist tried to aid the gods in their lessons to man. In the Museo Nazionale in Rome there is a mosaic in which a skeleton is shown against a silhouette of a man lying down. Beneath it is a Greek inscription that contains the equivalent of "Know thyself" (Pl. X).

When in his sixty-third year Dr. Samuel Johnson wrote a Latin poem called by the Greek original of "Know thyself," in which he listed his weaknesses and growing limitations, he had good classical justification and precedent.

Boasting, pride, vanity, insolence, presumption and undue prosperity were all things to be avoided. Nemesis was remorseless in punishing those who overstepped the bounds of moderation. Perhaps the best succinct explanation of her attitude is that given by Solon to Croesus prior to his downfall. Croesus found it incomprehensible at that time. The most significant sentence in it is as follows: "This wisdom, such as it is, observing that human life is ever subject to all sorts of vicissitudes, forbids us to be puffed up by the good things we have, or to admire a man's felicity while there is still time for it to change." [312] In short, "all human destiny is full of the fear and the peril that good fortune may be followed by evil." [313] "Quicquid fortuna exornat, cito contemnitur." [314]

[310] Herod. 7.18: . . . ἐπιστάμενος ὡς κακὸν τὸ πολλῶν ἐπιθυμέειν.

[311] See Chap. 4, "Γνῶθι Σεαυτόν in Greek and Latin Literature," in Wilkins, E. G., *The Delphic Maxims in Literature* (University of Chicago Press, Chicago, 1929).

[312] Plut., *Solon* 27.6 Perrin's translation in the Loeb Classical Library; cf. Theognis 657–664; Livy 42.62.3–4, 11.

[313] Soph., *Philoct.* 502–503 (Jebb's translation).

[314] Publilius Syrus.

Was it not theorizing about the vicissitudes of life to which Nemesis owed her birth and existence?

INSURANCE AGAINST REQUITAL FOR UNALLOYED JOY AND SUCCESS

The suffering of a penalty commensurate with the joy and prosperity that one has experienced is not inevitable. Amid great felicity some slight discomfiture is welcome as insurance against a greater one and may even be invoked. A good example is to be found in John Lyly's *Endimion:* [315]

> I pray thee, fortune, when I shall first meete with fayre Semele, dash my delight with some light disgrace, least imbracing sweetnesse beyond measure, I take a surfit without recure: let her practise her accustomed coynesse, that I may dyet my selfe upon my desires: otherwise the fulnesse of my ioyes will diminish the sweetnesse, and I shall perrish by them before I possesse them.

We have seen how Polycrates tried to ward off fate by throwing his ring into the sea,[316] but there are closer Greek and Roman parallels to the passage from Lyly. Philip the Great, receiving in one day news of several conspicuous successes, exclaimed: [317] "O Fortune, for all these great kindnesses do me some small mischief." This story has a good counterpart in Roman annals. Standing on the citadel of Veii and beholding the vastness of his victory, Camillus prayed in awe: [318] "O greatest Jupiter, and ye gods who see and judge men's good and evil deeds, ye surely know that it is not unjustly, but of necessity and in self-defence that we Romans have visited its iniquity upon this city of hostile and lawless men. But if, as counterpoise to this our present success, some retribution is due to come upon us, spare, I beseech you, the city and the army of the Romans, and let it fall upon my own head, *though with as little harm as may be.*" As he turned about, he stumbled and fell, to the great consternation of the bystanders, but to his own great relief, since he regarded the fall as an atonement for his good fortune.

[315] Act III, Scene iv. [316] See page 156.

[317] Plut., *Mor.* 177 C. The blessings may, perhaps, be those mentioned by Plutarch, *Alex.* 3.4–5.

[318] Plut., *Camill.* 5.6–7. The translation is by B. Perrin, in the Loeb Classical Library.

CLIMACTERICS

The idea that there are climacteric years in life in not uncommon today, as one may learn by inquiry among one's aged friends. According to Elworthy,[319] ". . . there is a very common belief that in seven years a man changes every atom in his body, and that each seventh year of his life is a climacteric in which he has to pass through dangers physical and moral. The sixty-third year, that is the ninth septennial period, is the 'grand climacteric' — the year specially perilous to old men."

This notion is ancient. The Emperor Augustus was greatly relieved when he had passed his sixty-third year. He was so jubilant, in fact, that in writing to his nephew about the event he addressed him as his "most charming little donkey." [320]

Another royal personage, Empress Catherine of Russia, is represented by Byron [321] as having felt similar fears about her climacteric: "Her climacteric teased her like her teens."

PART IV: OMENS OF DEATH AND BELIEFS ABOUT IT

"THOU OMINOUS AND FEARFUL OWL OF DEATH" [322]

Perhaps no sign of death is more widespread or more reliable and even inescapable than that of the owl sitting upon a house or other building.[323] It is still "the fatal bellman which gives the

[319] P. 407. See also *The Works of Sir Thomas Browne*, as cited in note 114, 3: 52–72.

[320] Aul. Gell., *Noct. Att.* 15.7: "meus asellus iucundissimus." See *Phil. Quart.* 2 (1923): 31, note 19.

[321] *Don Juan*, Canto X, Stanza 47.

[322] *I Henry VI*, IV.ii.15: cf. *III Henry VI*, II.vi.56–57:

> "Bring forth that fatal screech-owl to our house,
> That nothing sung but death to us and ours."

[323] See, for example, *Folk-Lore Record*, 1 (1878): 54–55, and compare Verg., *Aeneid* 4.462–463:

> "Solaque culminibus ferali carmine bubo
> Saepe queri et longas in fletum ducere voces."

stern'st good night." [324] In the *Faerie Queene* [325] Spenser is just as certain, though not so imaginative, in speaking of "The ill-faste Owle, Deaths dreadfull messengere."

It is more than a portent, it is a sure sign of disaster to come, if a snowy owl bumps his solid self against one's bedroom window. Those wild eyes, and outstretched beating wings and fluff of white feathers close pressed against the glass mean that he who sleeps within is no better than a dead man.[326]

A dramatic account of a death caused by an owl is told by a southern Negro: [327]

One time a ole scritch-owl sot on de ridge-pole uv my cabin un' mos' split his th'oat scritchin'. I settin' down in de cabin, waitin' for my ole man ter come home wid de ox-team. Dè scritch-owl kep' on scritchin'. I th'owed my apurn up ober my face an' sot dar an' shivered an' trimbled. De scritch-owl done got in good chune den, an' he kep' on scritchin'. My ole man nuvar did come home. He done drownded in de creek, cedar creek, one mile f'om de cabin.

If fear of the owl has anywhere been greater than in ancient Italy, this bird is nowhere else associated with the deaths of so many great men.[328] That of Augustus was presaged by an owl hooting upon the top of the Curia.[329] An owl screeching about the Capitol and others caught in the bedchambers of Commodus in Rome and at Lanuvium were terrible portents for this emperor.[330] The death of Valentinian was predicted in somewhat similar fashion.[331] An owl served notice that the last days of Pyrrhus were approaching.[332]

One cannot doubt, therefore, that Shakespeare was thoroughly

[324] Macbeth, II.ii.4–5.

[325] 2, Canto XII, Stanza 36.

[326] Weygandt, C., *The Red Hills* (University of Pennsylvania Press, Phila., 1930), p. 62.

[327] *The Atlantic Monthly*, 128 (1921): 763.

[328] The owl is frequently described by such adjectives as *funereus, sinister, ignavus, profanus*. Much classical lore about it has been collected by Thompson, as cited in note 200, pp. 45–46.

[329] Dio Cassius 56.29.3 (Loeb Classical Library edition, Vol. 7, p. 66): cf. Verg., *Georg.* 1.470.

[330] Dio Cassius 73.24.1; Ael. Lamprid., *Comm. Ant.* 16.5.

[331] Amm. Marc. 30.5.16.

[332] Aelian, *De Nat. Anim.* 10.37.

familiar with the owl's reputation in classical lands when he wrote in *Julius Caesar:* [333]

> And yesterday the bird of night did sit
> Even at noonday upon the market-place,
> Hooting and shrieking.

In view of the general Roman attitude toward the owl one is surprised to find Pliny the Elder [334] stating that he knows for a fact that an owl sitting on the top of a private house is not portentous of evil.[335]

THE "FATAL RAVEN" [336]

In the moving-picture version of Helen Hunt Jackson's novel *Ramona* a crow flutters against a windowpane as Ramona's little daughter lies dying.[337] When I saw this scene I wondered how many persons in the theater had more than a vague idea of the association of the crow with death.

The connection is made clear in an interesting story called "Judgment Crow," which was published by *The American Magazine* in September, 1928. If we may trust a Negro boy who takes a youthful white companion into his confidence, "Crow smartest bird dey is. . . . Crow always smart. Pappy say crow, he got a soul. When folks die crow grab his (*sic*) soul an' fly 'way with it."

In a more learned source, Southey's *Joan of Arc,*[338] the same sort of superstition may be found, for the death of Salisbury is preceded by the raven's croak upon the gale.

The direful character of the raven is well pictured by Marlowe in *The Jew of Malta:* [339]

[333] I.3.26–28.

[334] *Nat. Hist.* 10.35.

[335] Other references to the ominous character of the owl are Verg., *Aeneid* 12.862–864; Dio Cassius 56.45.2; Julius Obsequens 26, 32, 40, 46, 53; Sil. Ital. 8.636. See also Smith, as cited in note 105, pp. 302–303, and Stemplinger, p. 47.

[336] Shakespeare, *Titus Andronicus,* II.iii.97.

[337] Sandburg, Carl, *Abe Lincoln Grows Up* (Harcourt, Brace and Co., New York, 1926), p. 123, records the superstition that it is a sign of death if a bird alights on a window. See also Hazlitt, as cited in note 50, *s.v.* "Raven"; Henderson, p. 49.

[338] Book 8, lines 16–17, 38.

[339] Lines 640–643.

> The sad presaging Raven that tolls
> The sicke mans passeport in her hollow beake,
> And in the shadow of the silent night
> Doth shake contagion from her sable wings.

A raven perched upon a house is a final summons of death, as we may see from one of John Gay's pastorals: [340]

> The boding raven on her cottage sate
> And with hoarse croaking warn'd us of her fate.

Shakespeare employs this folklore idea figuratively: [341]

> O it comes o'er my memory,
> As doth the raven o'er the infected house.

In antiquity omens derived from ravens and crows were in accord with the well-established evil reputations of these birds. As Cicero was being taken to Cajeta by sea in an effort to elude his pursuers, a flock of crows flew with loud cries to the vessel "and alighting on either end of the sail-yard, some cawed, and others perched at the ends of the ropes, and everybody thought the omen was bad." [342] Cicero was assassinated not much later.

As early as the days of Hesiod there was a deep-seated fear of a crow sitting on a house and cawing.[343] Nor is the Negro boy's idea of the association of crows with souls a modern innovation, for a classical parallel may be found in Pliny,[344] who says that the soul of a certain Aristeas flew from his mouth in the form of a raven.

DEPARTURE OF THE SOUL AS A BIRD OR OTHER WINGED CREATURE

It seems safe to say that the dove is the bird most intimately associated with the soul. Characters in Thornton Wilder's *The*

[340] Gay, John, *The Shepherd's Week: Friday; or, The Dirge*, Pastoral 5, 103-104. See also Swainson, C., *Provincial Names and Folk Lore of British Birds* (Published by the English Dialect Society, Vol. 18), pp. 84, 89-90.

[341] *Othello*, IV.i.20–21.

[342] Plut., *Cicero* 47.5; cf. Plut., *Gracchi* 17.3–4. The translation is Perrin's, in the Loeb Classical Library.

[343] *Works and Days* 746–747.

[344] *Nat. Hist.* 7.174.

Bridge of San Luis Rey [345] discuss whether "the soul can be seen, like a dove, fluttering away at the moment of death."

In our own lore the appearance of a white bird is generally a sign of death.[346] Byron [347] makes use of this belief in describing the plight of sailors in a small boat at sea:

> About this time a beautiful white bird,
> Web-footed, not unlike a dove in size
> And plumage (probably it might have err'd
> Upon its course), pass'd oft before their eyes,
> And tried to perch, although it saw and heard
> The men within the boat, and in this guise
> It came and went, and flutter'd round them till
> Night fell: — this seem'd a better omen still.

This seemed a good omen, but later on the sailors began to perish one by one.[348]

As we shall see, the following quotation [349] from one of Margaret Widdemer's poems is realistic enough for an ancient martyrology:

> Pain has been and grief enough and bitterness and crying,
> Sharp ways and stony ways I think it was she trod,
> But all there is to see now is a white bird flying,
> Whose blood-stained wings go circling high, — circling up to God.

Many small winged creatures may represent the soul.[350] "In Yorkshire the country people used to call, and even now occasionally do so, night-flying white moths, 'souls.'" [351] A rather humorous reference to a similar belief is to be found in Victor Hugo's *Toilers of the Sea*,[352] where it is stated in the form of a pun that after death popes (*papes*) become butterflies (*papillons*).

[345] P. 179.

[346] Some interesting examples are to be found in *The Gentleman's Magazine*, 92 (1822), Part I, 311.

[347] *Don Juan*, Canto II, Stanza 94. [348] *Ibid.*, Stanza 102.

[349] I know this quotation only at second hand. Part of it provided a title for the book in which I found it, *A White Bird Flying*, by Bess Streeter Aldrich (D. Appleton and Co., New York and London, 1931). Quotation on p. 12.

[350] Dähnhardt, Oskar, *Natursagen: Eine Sammlung naturdeutender Sagen, Märchen, Fabeln und Legenden* (B. G. Teubner, Leipzig and Berlin, 1907–12), 3: 476–486.

[351] Thiselton-Dyer, T. F., as cited in note 185, p. 134.

[352] Book 2, Chap. 2, near end. "Après la mort, les papes deviennent papillons, et les sires deviennent cirons."

Literary use of the superstition about moths as souls was made by Thomas Hardy in "The Superstitious Man's Story," one of the tales in *Life's Little Ironies*. The following account is given of the death of a certain William Privett, who, after mowing in a meadow, sat down to lunch under a tree with a companion, John Chiles:

> Afterwards both of 'em fell asleep as they sat. John Chiles was the first to wake, and as he looked towards his fellow-worker he saw one of those great white miller's-souls as we call 'em — that is to say, a miller-moth — come from William's open mouth while he slept, and fly straight away. John thought it odd enough, as William had worked in a mill when he was a boy. He then looked at the sun, and found by the place o't that they had slept a long while, and as William did not wake, John called to him and said it was high time to begin work again. He took no notice, and then John went up and shook him, and found he was dead.[353]

In antiquity it was not uncommon to behold souls in the form of birds. Gregory of Tours [354] tells how monks in a monastery near Nursia saw a dove issue from the mouth of their abbot and ascend to heaven. St. Benedict [355] saw the soul of his sister Scholastica depart in this way.

The martyrologies provide other examples. It is recorded that at the death of St. Benignus, a reputed disciple of St. Polycarp, Christian watchers saw a dove fly heavenward from his prison.[356] It is stated that a dove issued from St. Polycarp as he was being slain.[357] When the head of St. Quintin was struck off a white dove came from his throat and rose to heaven.[358]

Perhaps the naïve character of these tales may be felt more

[353] On the soul leaving the body by the mouth, see Cox, pp. 41–43.

[354] *Dialogorum Liber IV*, 10 (Migne, *Patrol. Lat.*, Vol. 77, Col. 336. See also Cols. 332 338 and cf. Gregory, *De Gloria Martyrum*, 1.91 [*Patrol. Lat.*, Vol. 71, Col. 785]).

[355] S. P. Benedict, *Prolegomena*, 34 (Migne, *Patrol. Lat.*, Vol. 66, Col. 196).

[356] Bede, *Martyrologia*, Nov. 1 (Migne, *Patrol. Lat.*, Vol. 94, Cols. 1087–1088). See Lightfoot, J. B., *The Apostolic Fathers* (Macmillan and Co., London, 1885–90), Part II; 2: 975–976.

[357] *Letter of the Smyrnaeans on the Martyrdom of Saint Polycarp*, 16. It is not certain that the word "dove" appeared in the original text, but if it is an interpolation it is even more interesting from my point of view.

[358] Baring-Gould, S., *The Lives of the Saints* (John Grant, Edinburgh, 1914), 12 (Part II): 727.

vividly if I quote in the original part of a poem on the martyrdom of Eulalia: [359]

> Emicat inde columba repens,
> Martyris os nive candidior
> Visa relinquere, et astra sequi;
> Spiritus hic erat Eulaliae,
> Lacteolus, celer, innocuus. . . .
> . . . . . .
> Vidit et ipse satelles avem
> Feminae ab ore meare palam. . . .

There is good classical precedent for these ideas. For example, after the body of Augustus had been consumed on a pyre an eagle was released from it and appeared to bear his spirit to heaven.[360]

It may not be amiss to add that after Jesus was baptized "lo, the heavens were opened unto him, and he saw the Spirit of God descending like a dove, and lighting upon him." [361]

The dove was greatly beloved by the ancients. They endowed it with more virtues [362] than the crow has vices. One of its good points was that it had no bile.[363] For many reasons it was a very suitable bird to represent the soul. One can still see paintings of it in the catacombs of the Christians outside the walls of Rome.[364]

Among the ancients the butterfly, too, had associations with death. On a Pompeian mosaic [365] it appears, very appropriately, beneath a skull and amid other things that symbolize the transi-

[359] Prudent., *Peristeph., Hymn.* 3 (Migne, *Patrol. Lat.*, Vol. 60, Col. 352).

[360] Dio Cassius 56.42.3.

[361] Matthew iii.16: cf. Mark i.10; Luke iii.22; John i.32.

[362] It is made a paragon of virtue by Cyprian, *Liber de Unitate Ecclesiae*, 9 (*Patrol. Lat.*, Vol. 4, Col. 522).

[363] The Church Fathers seized upon this belief. Tertullian, *Liber de Baptismo*, 8 (Migne, *Patrol. Lat.*, Vol. 1, Col. 1317), says: ". . . quod etiam corporaliter ipso felle careat columba." Cyprian, *loc. cit.*, describes it as "non felle amarum." An interesting reference is Krauss, F. X., *Roma Sotteranea* (1873), p. 202.

[364] For the soul bird in general in antiquity see Weicker, G., *Der Seelenvogel in der alten Litteratur und Kunst* (B. G. Teubner, Leipzig, 1902).

[365] See Mau, August, *Pompeii: Its Life and Art*, translated by F. W. Kelsey (Macmillan Co., New York, 1907), p. 399.

tory character of human existence (see Pl. XI). One finds it sculptured on Roman tombstones.[366] It may be added that small winged souls are represented on Greek vase paintings (see Pl. XII).[367]

SWARMING OF BEES

Portents of death are derived from bees also. "If a swarm of bees settles on the wall of a house, or on a dead tree, or wooden stake, it is a sign of an approaching death in the family." [368]

Literary use of this superstition is made by John Gay: [369]

> Swarm'd on a rotten stick the bees I spy'd
> Which erst I saw when goody Dobson dy'd.

In antiquity the swarming of bees, along with other portents, was regarded as very ominous for armies and frequently signified their defeat or destruction. Just before the battle of the Ticinus, for which the Romans needed all the courage they could summon, a swarm of bees came to rest in a tree that sheltered the general's tent.[370] A swarm settled on the standards of the unfortunate Pompey while he was maneuvering against Caesar in Macedonia.[371] The foremost standard of Brutus was covered with bees at Philippi.[372] A number of terrible omens, among which was the swarming of bees in his camp, portended the violent death of the emperor Claudius.[373] Such activities of bees are recorded very frequently among the omens that preceded important engagements.[374]

[366] See *Corpus Inscriptionum Latinarum*, VI, Nos. 13196, 29417.

[367] Another example may be found in Fairbanks, A., *Athenian Lekythoi* (Vol. VI of the Humanistic Series, University of Michigan), Plate XIV, Figure 4.

[368] Wright, E. M., *Rustic Speech and Folk-Lore* (Oxford University Press, 1913), p. 216. See also Henderson, p. 309; Stemplinger, p. 32.

[369] *The Shepherd's Week: Friday; or, The Dirge*, Pastoral 5, 107–108.

[370] Livy 21.46.2.

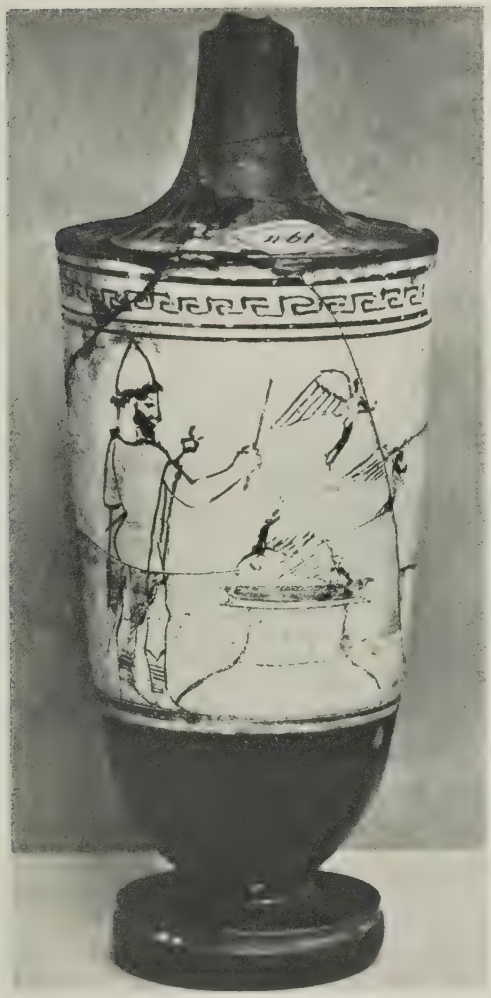
[371] Julius Obsequens 65 (125).

[372] Plut., *Brut.* 48.1.

[373] Dio Cassius 61.35.1 (Vol. 8, p. 32 in the Loeb Classical Library edition).

[374] Much lore of bees and many important references are to be found in A. S. Pease's notes on Cicero's *De Divinatione*, 1.73 (as cited in note 90).

PLATE XI



An Athenian vase (*lekythos*) showing winged souls. With his magic wand Hermes is summoning them to return to the lower world, the vent of which is represented as the top of a large jar, here a grave *pithos*. Reproduced from P. Schadow, *Eine attische Grablekythos* (Jena, 1897)

PLATE XII

A mosaic from the top of a Pompeian table. The butterfly below the skull and above the symbolic wheel of time represents the disembodied soul. "On the right and on the left are the spoils that short-lived man leaves behind him — here, a wanderer's staff, a wallet, and a beggar's tattered robe; there, a sceptre, with a mantle of royal purple. Over all is a level, with the plumb line hanging straight, symbolic of Fate, that sooner or later equalizes the lots of all mankind." — Mau-Kelsey, *Pompeii: Its Life and Art*, p. 399.

HOWLING OF DOGS

There are many conditions under which the howling of a dog may be an omen of death. Some of our own beliefs are as follows: [375]

If a dog points his nose toward you and howls at midnight, you will soon be killed.

There will be a death in the family if a dog howls at night (or some say, at midnight).

The disaster of death presaged by the howl of a dog at night (or according to some, at midnight) may be averted by turning an old shoe upside down

If a dog howls twice at night, a woman will die.

If a dog howls three times at night, a man will die.

A dog's howling in a doorway or beneath a window means death.

If a dog howls with his head down, there will be a death. If he howls with his head raised, there will be a fire.

The popular association of death with the howling of dogs was known to Shakespeare [376] also:

> The owl shriek'd at thy birth; an evil sign;
> The night-crow cry'd, aboding luckless time;
> Dogs howl'd, and hideous tempest shook down trees.

In Greek and Roman days dogs were equally prescient. Among the omens that portended the death of the younger Maximinus was the howling of dogs about his tent.[377] Such action seems to have presaged death and destruction in general. One of the signs of disaster for the Messenians in a conflict with Sparta during the First Messenian War was the howling of dogs after they had gathered on the same spot and their final desertion to the camp of the Spartans.[378] The howling of dogs like wolves and the growing of grass about the domestic altar of Aristodemus, king of Messenia, were causes of great concern to him. When

[375] Thomas and Thomas, p. 249, Nos. 3338, 3340-3341, 3343-3346. For a number of more or less similar German superstitions see Wuttke, pp. 198–199. Another valuable reference is Abbott, as cited in note 51, pp. 107–108.

[376] *III Henry VI*, V.vi.44–46.

[377] Jul. Capitol., *Maximini Duo* 31.2.

[378] Paus. 4.13.1: cf. 4.21.1.

the diviners placed an evil interpretation upon these events the king fell into despair and killed himself.[379]

There is at least one scientific man who believes that dogs have some peculiar faculty which enables them to detect the approach of death:[380]

> It is strange and very pathetic to watch the behaviour of a dog when his master is ill. The dog warned by his infallible instinct is afraid of disease, afraid of death. A dog accustomed for years to sleep on his master's bed is reluctant to remain there when his master is ill. Even in the rare exception to this rule, he leaves his master at the approach of death, hiding in a corner of the room and whining pitifully. It has even happened to me to be warned by the behaviour of a dog of the approach of death. What does he know about death? At least as much as we do, probably a good deal more. As I write this I am reminded of a poor woman in Anacapri, a stranger to the village, slowly dying of consumption, so slowly that one after another of the few *comari* who used to go and see her had got tired of her and left her to her fate. Her only friend was a mongrel dog, who, an exception to the rule I have just mentioned, never left his place at the foot of her bed. It was besides the only place to lie on, except on the damp earthen floor of the wretched hole the poor woman lived and died in. One day, as I happened to pass by, I found Don Salvatore there, the only one of the twelve priests of our little village who took the slightest interest in the poor and the sick. Don Salvatore asked me if I did not think the time had come to bring her the Last Sacraments. The woman looked about as usual, her pulse was not worse, she even told us she had felt a little better these last days — la miglioria della morte, said Don Salvatore. I had often marvelled at the amazing tenacity with which she clung to life and I told the priest she might quite well last for another week or two. So we agreed to wait with the Last Sacraments. Just as we were leaving the room the dog jumped down from the bed with a howl of distress and crouched in the corner of the room whining pitifully. I could see no change in the woman's looks, but noticed with surprise that her pulse was now almost imperceptible. * * * She drew a deep breath, a few drops of blood oozed out between her lips and it was all over. The immediate cause of the woman's death was evidently an internal haemorrhage. How did the dog know before I knew?

Another passage on the extreme sensitiveness of the dog is to be found in Gustave Flaubert's *Madame Bovary:*[381]

> A continual barking was heard in the distance. "Do you hear that dog howling?" said the chemist.
>
> "They smell the dead," replied the priest. "It's like bees; they leave their hives on the decease of any person."

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[379] Plut., *De Superstit.* 8.

[380] Munthe, Axel, *The Story of San Michele* (E. P. Dutton and Co., New York, 1930), pp. 60–62.

[381] P. 363 (Grosset and Dunlap, New York, n.d.).

Dogs have been popularly endowed with still another remarkable faculty, that of seeing ghosts. Apparently, this superstition was once common in Great Britain.[382] In Germany it is still a popular belief that some dogs can see spirits.[383]

A poetic record of the same idea is to be found in *The Merry Devil of Edmonton:* [384]

> I know thee well; I hear the watchful dogs,
> With hollow howling tell of thy approach;
> The lights burn dim, affrighted with thy presence;
> And this distemper'd and tempestuous night
> Tells me the air is troubled with some devil.

This is doubtless an old superstition. On one occasion when Odysseus and Telemachus were together Athena came and made herself visible to Odysseus alone. Telemachus was entirely unaware of her presence, but the dogs detected it.[385]

CROWING HENS

The crowing of a hen signifies many kinds of bad luck the world around, but it is rather generally agreed that such an event is ominous of death.[386] In Brittany "Hens are said to imitate the crow of a cock before a death and to turn towards the house in which the death will take place." [387] Austrians believe that when a hen crows in the house it presages death.[388] Among the descendants of the French in Louisiana it is thought that "Quand

[382] See Dyer, as cited in note 185, pp. 102, 220–221; Lean, as cited in note 117, 2 : 548; Hazlitt, as cited in note 50, 1 : 269–271; Campbell, J. G., *Witchcraft and Second Sight in the Highlands and Islands of Scotland* (James MacLehose and Sons, Glasgow, 1902), pp. 164–165.

[383] Wuttke, p. 198. See also Polson, as cited in note 91, pp. 17–18.

[384] The quotation is made from the edition by Walker, H. (J. Dent and Co., London, 1897), p. 3.

[385] *Odyssey* 16.159–162: cf. Theocr. 2.35–36.

[386] See, for example, Thomas and Thomas, p. 266, No. 3597; Bergen, as cited in note 43, p. 32, Nos. 273, 274, 276; *Journ. of Am. Folk-Lore*, 40 (1927) : 201, Nos. 1391, 1392.

[387] Johnson, W. B., *Folktales of Brittany* (London, Methuen & Co., 1927), p. 127.

[388] Stemplinger, E., "Abergläubisches bei Petronius," *Neue Jahrbücher für Wissenschaft und Jugendbildung*, 4 (1928) : 324.

une poule chante coq, le père ou la mère va mourir tout de suite." [389]

A crowing hen is counted on the Borders [between England and Scotland] a forerunner of death. Thus, a few years ago, we are told, an old woman in the parish of East Kilbride heard one of her hens crow loudly on the top of a dyke before her house. She mentioned the circumstance to a neighbour, saying that no good would come of it, and accordingly her husband soon died. About a month afterwards she heard the creature again, and within a few days tidings reached her of the death of her only son. A week later the hen crowed once more, and the eldest daughter died. On this the old woman was roused to desperation; she seized the warning bird, wrung its neck, and burned it.[390]

Even in far-away Sierra Leone the dangers of "keeping chickens" are recognized: [391]

A hen crowing like a cock in the morning means the death of a woman; some people kill the hen. If a hen crows several times, the owner offers it anything it will eat and gives it away after praying; then only one person will die.

The ancients, too, associated the crowing of the hen with death, but it was an indication that the wife would survive the husband.[392] The unseasonable crowing of a cock was likewise a bad sign.[393] Amid the merriment of a banquet Trimalchio heard a cock crow. He knew that there was going to be a fire or that someone in the neighborhood was about to lose his life.[394]

THE SHOOTING STAR

In our own land "A shooting star means that another soul is passing into heaven." [395] A star dropping toward the earth is

[389] *Journ. of Am. Folk-Lore*, 40 (1927) : 201, No. 1393.

[390] Henderson, p. 44: cf. Thomas and Thomas, p. 266, No. 3598; *Journ. of Am. Folk-Lore*, 40 (1927) : 201, No. 1392.

[391] Thomas, N. W., *Anthropological Report on Sierra Leone* (Harrison and Sons, London, 1916), Part I, p. 90.

[392] Donatus on Terence, *Phormio* 708.

[393] Pliny 10.49: "Habent ostenta ex se et praeposteri eorum (gallorum) vespertinique cantus." In Thomas Hardy's *Tess of the D'Urbervilles*, Chap. 33, the crowing of a cock three times in the afternoon is regarded as a sign that the bride is not virtuous.

[394] Petronius 74.

[395] *Journ. of Am. Folk-Lore*, 36 (1923) : 9.

sometimes said to be "marking a path for somebody's soul." [396] I have already quoted Wordsworth:

> The Soul that rises with us, our life's Star,
> Hath had elsewhere its setting. . . .

Italians say that a falling star either presages or announces a death.[397] In at least one Department of France people seeing such a star say *Requiescat in pace.* They believe that by these simple words they are saving a soul from Purgatory.[398]

Among the ancients a star drawing out its fiery trail as it descended signified death and destruction.[399] In astrological lore a star falling under certain conditions of the heavenly bodies might mean the ruin of a king and his people.[400]

The lives of stars and men have always been closely interwoven, but perhaps the belief in their relationship had a greater proportion of adherents in antiquity than it does today, even if the theories about them were not more complicated. We speak of a man's star as setting or as having set, but this is a mere vestige of the original idea. It was a popular ancient belief that each person had his own particular star, a bright one for a rich man, one less bright for a man not well-to-do, a dim one for the unsuccessful man. Each individual had a star suitable to his luster or dullness. At the birth of a child a star sprang into existence and at his death it died.[401]

DEATH AND PROPHECY

The idea that men about to die have a strange foresight and insight that make their prophecies peculiarly dependable is com-

[396] Peterkin, Julia, *Scarlet Sister Mary*, pp. 91–92.

[397] Belluci, G., *Le Stelle Cadenti e le Loro Leggende* (Perugia, 1893), p. 15.

[398] *Ibid.*

[399] Seneca, *Troades* 356–357:

> "Et stella longa semitam flamma trahens
> Dant signa fati. . . ."

The belief is mentioned by Pliny, *Nat. Hist.* 2.28.

[400] *Cat. Cod. Astrol. Graec.*, 8, Part 3, p. 183, line 3: cf. p. 123, lines 14–15; p. 182, lines 22–23.

[401] These beliefs are recorded by Pliny 2.28, but he says that they are not true.

mon in many literatures. It is one of the superstitions with which Charles Reade vivifies his deservedly famous story, *The Cloister and the Hearth.*[402] Byron speaks of "death's prophetic ear."[403] In *The Merchant of Venice*[404] Nerissa says to Portia: "Your father was ever virtuous, and holy men at their death have good inspirations; . . ." Shakespeare employs the same belief in part of the dying speech of John of Gaunt:[405]

> "Methinks I am a prophet new inspir'd,
> And thus expiring do foretell of him:
> His rash fierce blaze of riot cannot last,
> For violent fires soon burn out themselves; . . ."

Similar passages abound in classical literature.[406] Not long before taking the fatal hemlock Socrates tells his persecutors that he wishes to make a prediction about them: "For," says he, "I am now in that position when men are most wont to prophesy, when they are at the point of death."[407] This superstition was in full bloom in the time of Homer, since he records the prophecies of Patroclus to Hector[408] and of Hector to Achilles.[409]

The theory behind this belief is that the soul of man becomes more divine at the advent of death and hence can foresee the future.[410]

[402] Pp. 561, 569–570, 580, 593, 628 of Everyman's Library edition.

[403] *Childe Harold*, 3.23.

[404] I.i : 30–31.

[405] *King Richard the Second*, II.i.31–34. See Thiselton-Dyer, T. F., *Folk Lore of Shakespeare* (Griffin & Farran, London, 1884), pp. 340–341. An interesting reference is *Choice Notes from "Notes and Queries"* (Bell and Daldy, London, 1859), pp. 124–128.

[406] See A. S. Pease on Cicero, *De Divinatione* 1.63 (as cited in note 90), where copious references are given. An important additional reference is Gregory, *Dial. Liber* 4.26 (Migne, *Patrol. Lat.*, Vol. 77, Cols. 357–364: see also Col. 397).

[407] Plato, *Apol.* 39 C.

[408] *Iliad* 16.851–854.

[409] *Iliad* 22.356–360: cf. Servius, on *Aeneid* 4.613: ". . . Homerus qui morituros divinantes frequenter inducit."

[410] Xen., *Cyrop.* 8.7.21: cf. Cic., *De Sen.* 22.81: "Atqui dormientium animi maxime declarant divinitatem suam; multa enim, cum remissi et liberi sunt, futura prospiciunt. Ex quo intelligitur quales futuri sint cum se plane corporum vinculis relaxaverint." This passage becomes more meaningful when we remember that death and sleep were sometimes regarded as twin brothers.

DEATH AND EBB TIDE

It is not an uncommon superstition that the soul goes out with the ebbing of the tide. It exists along the New England coast [411] and is effectively used in both of Julia Peterkin's novels of Negro life.[412] In one of them [413] Granny is too deliberate in preparing birth charms, and Black April exhorts her: "'Granny,' he stopped to clear the huskiness out of his throat, 'better make haste. De tide'll turn soon. Ebb tide ain' to be trusted, you know.'"

This belief was once current "along the east coast of England, from Northumberland to Kent" [414] and perhaps still is. Dickens made use of it in his picture of Mr. Peggotty at Barkis's bedside in *David Copperfield:* [415]

"People can't die, along the coast, except when the tide's pretty nigh out. They can't be born, unless it's pretty nigh in — not properly born, till flood. He's agoing out with the tide. It's ebb at half-arter three, slack water half-an-hour. If he lives till it turns, he'll hold his own till past the flood, and go out with the next tide."

Barkis did finally go out with the tide. Another literary character who departed in this way is Falstaff. Shakespeare makes Mrs. Quickly say of him: [416] "A' made a finer end, and went away, an it had been any christom child; a' parted even just between twelve and one, even at the turning o' the tide; . . ."

I should like to know whether Tennyson was at all indebted to this superstition when he wrote:

> And may there be no moaning of the bar,
> When I put out to sea.

The naïve confidence of the common people in the belief that life departs with the ebbing tide is shown by their recording in parish records the state of the tide at the time of death.[417]

[411] Bergen, p. 126, No. 1184: "Death takes place at ebb tide."
[412] *Black April*, pp. 12, 23, 178, 217; *Scarlet Sister Mary*, p. 324.
[413] *Black April*, p. 12.
[414] Henderson, p. 58.
[415] Chap. 30.
[416] *King Henry V*, II.iii.11–14.
[417] Henderson, p. 58.

Though life has doubtless been departing with the falling tide from time immemorial, the oldest classical record of it is in Pliny,[418] who makes Aristotle authority for the statement that no animal dies except when the tide is receding. Pliny adds that the belief was tested along what he calls the "Gallic Ocean," but was found to be true of man only.

It is a most remarkable coincidence that in 1727 and the two following years scientific observations were made in part of the same region in order to dissipate the illusion, but without lasting success.[419] In Boulogne the expression "to go out with the tide" (*s'en aller avec la marée*) still means "to die." [420]

TREES AND DEATH

Trees are associated with death, just as they are with birth. In *King Richard II* [421] Shakespeare writes:

> 'Tis thought the king is dead: we will not stay.
> The bay trees in our country are all withered. . . .
> . . . . . .
> These signs forerun the death or fall of kings.
> Farewell: our countrymen are gone and fled,
> As well assur'd Richard their king is dead.

It was the custom of the Caesars who had enjoyed a triumph to plant branches of laurel in a grove outside Rome. It was noticed that the tree which each one had set withered just before he died. In Nero's last year the whole grove died and his line of Caesars ended with it.[422] Domitian's death was portended by the falling down of a tree.[423] Among the omens that warned of the death of Alexander Severus was the falling of an ancient laurel tree and three fig trees.[424]

Such ideas were so common in Rome that even the existence

[418] *Nat. Hist.* 2.220: cf. Philostr., *Vit. Apoll.* 5.2.

[419] See Lecky, W. E. H., *History of European Morals from Augustus to Charlemagne* (D. Appleton and Co., New York, 1929), 1 : 371.

[420] Rappoport, as cited in note 51, p. 42.

[421] II.iv.7–17.

[422] Suet., *Galba* 1.

[423] Suet., *Domit.* 15.

[424] Ael. Lamprid., *Alex. Sev.* 60.4–5.

of the city was at one time associated with the sacred fig tree under which Romulus and Remus were nourished by the wolf. When this tree (or a descendant of it)[425] began to wither in the time of Nero, the Romans viewed the event as a prophecy, but it finally put forth new shoots and relieved the fears of the people.[426]

The association of trees with life and death is widespread.[427] The reader has doubtless already recalled "that forbidden tree whose mortal taste first brought death into the world. . . ." According to a theory formulated by Sir J. G. Frazer, in the original version of the story of the Garden of Eden there may have been a tree of death as well as a tree of life.[428]

DEATH CAUSED BY MAGIC

Magical arts may be a menace throughout the journey of life. According to a superstition in at least one part of the United States, "If you draw a picture of your enemy and shoot it with a silver bullet, he will suffer pain where the bullet strikes."[429] This crude superstition would seem to be far removed from the actualities of life, but people have placed implicit confidence in it and have tried to give it practical expression, as is shown in a biography of Johnny Appleseed:[430]

> Johnny stayed all night at the Squire's and next morning they went over to Hiram Haynes who lived in Cross Creek township on a farm adjoining the Squire's. Several members of his family had been sick for some time,

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[425] Cf. Pliny 15.77: "Nec sine praesagio aliquo arescit rursusque cura sacerdotium seritur."

[426] Tac., *Ann.* 13.58.

[427] On life tokens see Hartland, E. S., "The Life-Token in Tale and Custom," *The Legend of Perseus* (D. Nutt, London, 1894–96), 2 : 1–54; Frazer, J. G., "The External Soul in Folk-Tales," *Balder the Beautiful* (Macmillan and Co., London, 1914), 2 : 95–152; Macculloch, J. A., "The Separable Soul," *The Childhood of Fiction: A Study of Folk Tales and Primitive Thought* (E. P. Dutton & Co., New York, 1905), pp. 118–148.

[428] *Folk-Lore in the Old Testament* (Macmillan and Co., London, 1919), 1 : 47–48.

[429] Thomas and Thomas, p. 171, No. 2177: cf. p. 282, Nos. 3829–3833. See also Randolph, Vance, *The Ozarks: An American Survival of Primitive Society* (The Vanguard Press, New York, 1931), p. 128.

[430] Pershing, Henry A., *Johnny Appleseed and His Time* (Shenandoah Publishing House, Strasburg, Virginia, 1930), pp. 220–221.

but no one seemed to know what was the matter with them, hence they came to the conclusion they were bewitched. They were also convinced after a consultation with Squire Day, that Granny Daugherty was the very witch who had done it, therefore, they would kill her with a silver bullet and do it right away.

Hiram Haynes had been a captain in the Revolutionary War and on his old military coat were some silver buttons. They cut off one of them, melted it in a bullet-mould and rammed it into a shot gun. One of the Haynes boys drew an outline picture of Mrs. Daugherty and placed it on the side of the barn as a target. Everything was now ready to slay the witch, but before shooting, some of the boys were sent to Granny Daugherty's cabin to watch the results of the killing, for she lived only a short distance away. She was sweeping her cabin floor, smoking her pipe and at intervals they could hear her crooning a song or talking to the cat, utterly ignorant of the fact that she was to be dispatched so summarily. The belief was, that when the shot penetrated the picture of the witch, the original would either fall dead or her powers would be gone from her forever.

Haynes fired the gun, which having a generous load of powder made so loud a report as to greatly frighten the old lady, who fell trembling to the floor. The watchers rushed to her assistance, aroused her from her fainting spell, which was followed by frightful groans. She regained consciousness but her power for evil had left her. They placed her upon the bed, where after lingering in a semi-stupor for a few days, she died.

An incident not less strange is told by Stevenson in *Catriona*.[431] In this tale a "grandsire gied Sandie a siller tester to pit in his gun wi' the leid draps, bein' mair deidly again bogles." Sandie used the gun to shoot a wizard:

> When the corp was examined the leid draps hadnae played buff upon the warlock's body; sorrow a leid drap was to be fund; but there was grandfather's siller tester in the puddock's heart of him.

In England there have been found in old houses hearts, said to be those of pigs, stuck full of pins and thorns (see Fig. 2). They were designed to work injury to the inhabitants.[432] "Clay or wax images, pierced through with pins and needles, are occasionally met with in churchyards and gardens, where they have been placed for the purpose of causing the death of the persons they represent."[433]

[431] Chap. 15.

[432] Elworthy, p. 53. See also pp. 49 (especially note 74), 54–56.

[433] Harland and Wilkinson, p. 164. See also p. 188. Other references are Henderson, pp. 219–224, 228–230; Dalyell, as cited in note 32, pp. 341–345; Tavenner, E., *Studies in Magic from Latin Literature* (Columbia University Press, New York, 1916), p. 10, note 43.

Fig. 2. A heart, said to have been that of a pig; "found October 1882 in a recess of a chimney in an old house . . . in the village of Ashbrittle." Reproduced from F. T. Elworthy, *The Evil Eye*, p. 53

Royal personages as well as common people have been exposed to this form of magic. Plotters against the lives of King Philip VI of France and his queen pierced to the heart baptized waxen images that had been made of the sovereigns.[434]

An early reference in poetry to this form of magic occurs in Chaucer: [435]

> There saugh I pleyen jugelours,
> Magiciens, and tregetours,
> And phitonisses, charmeresses,
> Olde witches, sorceresses,
> That use exorsisaciouns,
> And eke thes fumigaciouns;
> And clerkes eke, which konne wel
> Alle this magike naturel,
> That craftely doon her ententes,
> To make in certeyn ascendentes,
> Ymages, lo, thrugh which magike,
> To make a man ben hool or syke.

[434] Lucas, H. S., *The Low Countries and the Hundred Years' War, 1326–1347* (University of Michigan Publications, History and Political Science, Vol. 7, Ann Arbor, 1929), pp. 177–178. See also Henderson, p. 228, and Cox, p. 220, for other records of similar plots or attacks upon royalty.

[435] *The House of Fame*, 3.169–180.

A recent allusion to this superstitious practice may be found in Rossetti's *Sister Helen:*

> Why did you melt your waxen man,
> Sister Helen?

Such Old World magic is still practiced by immigrants in America. There is a rather recent example of it in Chicago.[436]

> . . . Vincenzo was to marry Carolina, but Concetta wanted him, and when she found she could not get him she took a doll and called it Vincenzo. She stuck a pin into it every day and each time she did so a stroke went through Vincenzo's heart. Then, when the doll was full of pins, she threw it into the Lake [Michigan]. At this point Vincenzo's mother consulted a famous *maga* who told her that the only way to save her son would be to find the doll and pull out the pins. How could the poor woman find a doll in Lake Michigan? So of course Vincenzo died.

Sympathetic magic of this character flourished in antiquity. Ovid [437] tells how the death of enemies may be encompassed by driving needles into the hearts of waxen images. Plato [438] speaks of the alarm men felt when they merely saw waxen images of themselves. Another practice of the Greeks and the Romans was to write down the names of enemies and to drive nails through them.[439] This method of nailing one's enemies must have been doubly effective in the days when the name represented the very essence of a person or thing.

It was doubtless because injury might be inflicted upon an enemy through the impression or mold of the body upon the bed that some of the ancients recommended ruffling the bedclothes

[436] P. 74 of an article by Alice Hamilton, "Witchcraft in West Polk Street [Chicago]," *The American Mercury*, 10 (1927) : 71–75. Even children may resort to this kind of magic. A friend tells me that as a child of seven years she and a boy playmate decided to kill five children of a neighboring family. They selected five sticks, gave them the names of the objects of their dislike, laid them down in a row, chopped them up and buried them.

[437] *Heroides* 6.91–92.

[438] *Laws* 933 B: ἂν ποτε ἄρα ἴδωσί που κήρινα μιμήματα πεπλασμένα.

[439] See Pauly-Wissowa, *Real-Encyclopädie*, *s.v. Defixio*. The literature of this subject is given by Fox, W. S., *The Johns Hopkins Tabellae Defixionum* (The Johns Hopkins Press, Baltimore, 1912), pp. 5-6. A later reference is Besimer, M., *Revue de philologie*, 44 (1920) : 5-30. See also Elworthy, pp. 328-329. An illuminating comment is made by Pliny 28.19: "Defigi quidem diris precationibus nemo non potuit."

on arising.[440] Some confirmation of this theory may be found in the belief that driving a nail into the place where the head of an epileptic had rested would cure the patient of his affliction.[441]

The forms of sorcery which attempted to make individuals suffer injuries or death by maltreating their likenesses have left modified survivals in the custom of burning and hanging in effigy.[442]

There is a close ancient parallel to the belief that injury to a picture will cause injury to the person represented. In his account of the wars between the Romans and the Goths Procopius [443] gives an example which had some historical significance:

> There was in the market-place [at Naples] a picture of Theoderic, the ruler of the Goths, made by means of sundry stones which were exceedingly small and tinted with nearly every colour. At one time during the life of Theoderic it had come to pass that the head of this picture fell apart, the stones as they had been set having become disarranged without having been touched by anyone, and by a coincidence Theoderic finished his life forthwith. And eight years later the stones which formed the body of the picture fell apart suddenly, and Atalaric, the grandson of Theoderic, immediately died. And after the passage of a short time, the stones about the groin fell to the ground, and Amalasuntha, the child of Theoderic, passed from the world. Now these things had already happened as described. But when the Goths began the siege of Rome, as chance would have it, the portion of the picture from the thighs to the tips of the feet fell into ruin, and thus the whole picture disappeared from the wall. And the Romans, divining the meaning of the incident, maintained that the emperor's army would be victorious in the war, thinking that the feet of Theoderic were nothing else than the Gothic people whom he ruled, and, in consequence, they became still more hopeful.[444]

THE DEPARTURE OF THE SOUL BY THE MOUTH

At death the soul leaves the body, but by what avenue? In modern poetry there are several verses like the following:

[440] Plut., *Symp.* 8.7.4; Iambl., *Adhort. ad Philos.* 21; Clemens Alexand., *Strom.* 5.5 (Migne, *Patrol. Graec.*, Vol. 9, Col. 49). See also Frazer, J. G., *Folk-Lore*, 1 (1890): 157, 159. The explanations of the practice recorded by Plutarch seem like foolish guesses.

[441] Pliny 28.63.

[442] Cox, p. 222. See also Elworthy, p. 77.

[443] Procop. 5.24.22–27 (H. B. Dewing's translation in the Loeb Classical Library).

[444] Cf. Thomas and Thomas, p. 71, No. 729: "If a person dies, his picture will fade." Another interesting reference is Bergen, pp. 160–161.

And our spirits rushed together at the touching of the lips; [445]
My spirit closed with Ida's at the lips; [446]
Soul meets soul on lovers' lips; [447]
Seele rann in Seele.[448]

An example is to be found in Cervantes: [449] "Y juntando mas su boca con la mia, auiendo cerrado los labios para darme el primero y ultimo beso, al abrillos se le salio el alma, y quedó muerta en mis braços."

These quotations look like modern poetical conceits, but in origin such ideas are neither modern nor poetical, nor are they conceits in the ordinary sense of this word. In spirit they go back to a time when people, noticing that life ceased when breath left the body,[450] concluded that the breath was the seat of life. Hence the soul could be wherever the breath was. It is a commonplace that in many languages the words "breath" and "soul" are one and the same.

Classical analogues to the verses I have quoted are common. A couplet in the *Greek Anthology* [451] tells how a girl, while kissing her beloved Agathon, had her soul on her lips, as though it were about to cross over to him. In a mime of Herodas a mother requests a schoolmaster to beat her troublesome son until his soul is hanging on his lips.[452] As early as Homer we find reference to the soul as passing the barrier of the teeth.[453] Many other examples might be given to show that the soul came to the lips and departed through them.[454]

[445] Tennyson, *Locksley Hall*, 38.
[446] Tennyson, *The Princess*, 7.158.
[447] Shelley, *Prometheus Unbound*, IV.451. [448] Schiller, *Amalia*.
[449] *Obras completas*, edited by R. Schevill and A. Bonilla (Impr. de B. Rodríguez, Madrid, 1914), 1 : 38. The quotation is from Galatea, lines 21–24.
[450] We still speak of a person as "breathing his last." Cf. Babrius 122.3–4: *Θνήσκω, μέλλω τ'ἀποπνεῖν.* In a South Slavic tale the fate of a mouse which has enjoyed the doubtful blessing of being rescued from the claws of a kitten by a cat is thus described: "Zwischen ihren Zähnen die Seele aushauchend sprach zu ihr das Mäuslein: ‚Ich verzeihe dir meinen Tod, hast du mich doch endlich aus Feindes Klauen entrissen.'" See Krauss, F. S., *Sagen und Märchen der Südslaven* (Leipzig, 1884), Vol. 2, No. 14.
[451] 5.78: cf. 5.14. [452] Herodas 3.1–4. [453] *Iliad* 9.408–409.
[454] I am quoting three from Seneca: *Herc. Fur.* 1308–1310, "hanc animam levem . . . in ore primo teneo"; *Epist.* 30.14, "non dubitare autem se quin

If the soul may reach the lips and be breathed out, may it not pass through another person's lips? There is a record of a Lancashire woman who received a "witch's last breath into her mouth, and with it the familiar spirit." [455]

Every diligent student of folklore has seen the following passage from Tylor's *Primitive Culture* [456] quoted many times: "Among the Seminoles of Florida, when a woman died in childbirth, the infant was held over her face to receive her parting spirit, and thus acquired strength and knowledge for its future use."

Whatever may be the value of this quotation, I am more interested in literary uses of the belief. Pope makes the dying Eloisa say to Abelard: [457] "Suck my last breath and catch my flying soul." At the end of the fragment of an elegy on the death of Adonis Shelley writes:

> Oh let thy breath flow from thy dying soul
> Even to my mouth and heart, that I may suck. . . .

It seems fairly certain that such lines are reminiscences of similar ideas in the classics. Perhaps Pope and Shelley had in mind Vergil's description [458] of the way in which Anna hopes that she may find some breath lingering in the body of Dido upon the pyre and catch it with her lips. In a poem of consolation [459]

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senilis anima in primis labris esset"; *Nat. Quaest.*, 3 *Praef.* 16, "in primis labris animam habere." An interesting variation is Petronius 62: "Mihi anima in naso esse, stabam tanquam mortuus." A valuable reference in this connection is Headlam, W., *Herodas: The Mimes and Fragments* (Cambridge: At the University Press, 1922), pp. 119–120.

[455] Harland and Wilkinson, p. 210.

[456] 1 : 433 (as cited in note 110). See also Frazer, J. G., *The Dying God* [3] (Macmillan and Co., London, 1919), pp. 198–200.

[457] *Eloisa to Abelard* 324.

[458] *Aeneid* 4.684–685. In his note on this reference Servius seems to be unduly cautious: ". . . muliebriter tamquam possit animam sororis excipere et in se transferre."

[459] *Consolatio ad Liviam* 157–158:

> "Sospite te saltem moriar, Nero: tu mea condas
> Lumina et excipias hanc animam ore pio."

Cf. 95–97:

> "At miseranda parens suprema neque oscula legit,
> Frigida nec fovit membra tremente sinu;
> Non animam opposito fugientem excepit hiatu."

the wife of Augustus, who has lost one son by death, is represented as trying to find comfort in the thought that a second son survives to catch her final breath. Another example is recorded by Cicero [460] who tells how some wretched mothers passed a night at the doors of a prison, beseeching only the privilege of catching with their lips the dying breath of their sons.[461]

It is obvious, of course, that the belief in the possibility of the transfer of the soul through the mouth is a logical result of the localization of the seat of life in the breath.

HINDRANCES TO THE DEPARTURE OF THE SOUL

As the advent of a child into the world may be delayed by crossing parts of the body, so one's exit may be retarded by anything suggestive of binding or hampering. In *Guy Mannering* [462] Scott thus describes how the gipsy woman, Meg Merrilies, speeds the departure of the soul of a dying man:

". . . It will not be," she muttered to herself; "he cannot pass away with that on his mind, it tethers him here —

Heaven cannot abide it,
Earth refuses to hide it.

I must open the door"; and, rising, she faced towards the door of the apartment, observing heedfully not to turn back her head, and, withdrawing a bolt or two (for, notwithstanding the miserable appearance of the place, the door was cautiously secured), she lifted the latch, saying,

"Open lock, end strife,
Come death, and pass life."

A little later, when some ruffians intrude and ask how she dares leave the door open she asks: "And wha ever heard of a door being barred when a man was in the dead-thraw? how d'ye think the spirit was to get awa through bolts and bars like thae?"

Such notions can be readily paralleled in other parts of the

[460] *In Verrem* 5.45.118.

[461] Other interesting references are Seneca, *Herc. Oet.* 1345–1346; Ovid, *Met.* 12.424–425; *idem*, *Ars Am.* 3.743–744. See also Duncan, T. S., "The Transfer of the Soul at Death," *Class. Journ.*, 25 (1929) : 230–234.

[462] Chap. 27.

world,[463] but I have no precise analogue for classical antiquity, although the same sort of reasoning (or lack of reasoning) prevailed. When Phaedo and his friends arrived at the cell of Socrates to spend the last day with him, they were informed that the Eleven were freeing the prisoner from bonds and announcing that he must die on that day. The act may have been purely humanitarian, but if it was, it was strangely inconsistent with the general attitude of the persecutors.[464]

As the soul of Dido could not free itself from her close-locked limbs, Juno sent Iris to release it. Iris cut her hair and the soul departed into the winds. It is true that the hair was an offering to Pluto, but it seems clear that the cutting was a sympathetic act to release the spirit.[465]

GOING WEST

During the Great War the soldier dead "went west." The region of the dead is naturally in the land of the setting or dying sun, and the dead have been "going west" from time immemorial. When Ulysses went to pay a visit to Hades he directed his course westward.

The following is Lewis Campbell's rendering of a passage in Sophocles' *Oedipus Tyrannus:* [466]

> But flocking more and more
> Toward the western shore,
> Soul after soul is known to wing her flight,
> Swifter than quenchless flame to the far realm of night.[467]

According to a folk belief the corpse "should not meet the sun in its course, which is called burying the back-way." [468] Some tribes buried their dead facing the setting sun.

[463] Samter, as cited in note 188, p. 28; Blakeborough, Richard, *Wit, Character, Folklore and Customs of the North Riding of Yorkshire* (London, 1898), p. 120; Wright, as cited in note 368, p. 277; *Proc. Am. Philosoph. Soc.*, 25 (1888) : 160, No. 14. See also McCartney, E. S., "The Removal of Bonds from Prisoners and Slaves in Times of Stress," *Class. Phil.*, 26 (1931) : 166–171.

[464] Plato, *Phaedo* 59 E.

[465] Verg., *Aeneid* 4.693–705.

[466] 175–178.

[467] In the myths of many tribes the west has been the land of the dead. See Tylor, as cited in note 110, *s.vv.* "Death" and "West."

[468] Lean, as cited in note 117, Vol. 2, Part II : 596.

Perhaps the fact that, in the eyes of most ancient peoples, the west was in general more of a region of mystery than was the east contributed in some measure to their sending their dead in this direction.

CALLING THE DEAD AS A TEST OF DEATH

So far as I know we have no popular test of death that goes back to antiquity, but until recent years an old Roman custom left a survival in ceremonies attendant upon the death of a pope.[469] It has been described as follows: [470]

> As soon as may be after death has occurred, the body must be formally recognized by the Cardinal Camerlingo, who, in obedience to an ancient custom, first knocks thrice on the door of the bedchamber. Getting no answer, he enters, and taps thrice with a silver mallet on the dead man's forehead, and thrice calls him by name. No response coming, the Camerlingo declares that the Pope is dead.[471]

In classical times the Romans addressed the dead three times.[472] Even among them the custom was doubtless a survival from a time

[469] This custom was not observed at the death of Pope Benedict XV, but I do not know just when it was given up.

[470] Thayer, W. R., *Italia: Studies in Italian Life and Letters* (Boston, Houghton, Mifflin and Co., 1908), p. 195.

[471] The ceremony at the death of Pope Gregory XVI is thus described by D'Azeglio, Massimo, *I Miei Ricordi* (G. Barbèra, Florence, 1899), 2 : 223–224: "Morto il papa, è avvisato il cardinal camerlingo che si presenta con altri prelati. Chiama a nome il papa tre volte; e siccome non ottiene riposta, gli vien presentato su un piatto un martello d'argento col manico d'ebano, col quale percuote tre volte la fronte del cadavere. Con ciò s'intende provata la morte del papa, ed è annunziata prima al Senatore di Roma chiamato dall' anticamera, dove stava aspettando. Si rompe l'*annulus piscatoris*, e il Senatore allora dice: *Io prendo dunque il comando di Roma;* ma in effetto non lo prende niente affatto; e si contenta, tornato in Campidoglio, di ordinare che si suoni campanone della torre, al quale fanno eco tutte le campane della città."

[472] See, for example, Verg., *Aeneid* 6.505–506:

> Tunc egomet tumulum Rhoeteo in litore inanem
> Constitui et magna Manis ter voce vocavi.

See also *Aeneid* 1.216–219:

> Postquam exempta fames epulis mensaeque remotae,
> Amissos longo socios sermone requirunt
> Spemque metumque inter dubii seu vivere credant
> Sive extrema pati nec iam exaudire vocatos.

and 2.644:

> Sic, o sic positum affati discedite corpus.

Compare *Odyssey* 9.65; Theocr. 23.44; Catull. 101.10; Ovid. *Met.* 10.62–63; *idem, Trist.* 3.3.43–44; *idem, Fasti* 4.852.

when failure to receive an answer was taken as a proof of death, but there exists a vivid account of the application of this test of life as late as 39 B.C.[473] During the civil strife of that year the leaders of the rival forces conferred near Misenum. Augustus and Antony, with their army behind them, held a parley across a stretch of water with Sextus Pompey, who enjoyed the security of a mound in the sea, with his fleet stationed not far away. When the compacts had been reduced to writing and pledges exchanged, there was a demonstration of joy that broke all bounds. Soldiers who were in small boats jumped out and swam in their eagerness to reach the land.

> Some knew that their relatives and associates were living, and seeing them now present, gave way to unrestrained joy. Others, supposing that those dear to them had already died, saw them now unexpectedly and for a long time were at a loss what to do, and were rendered speechless, at once distrusting the sight they saw and praying that it might be true, and they would not accept the recognition as true until they had called their names and had heard their voices in answer; then, indeed, they rejoiced as if their friends had been brought back to life again, but as they must perforce yield to a flood of joy, they could not refrain from tears.[474]

TELLING THE BEES

There still exist in many civilized countries remains of belief in animism. One of the most picturesque customs illustrative of animism is that of telling the bees when the master or mistress of a house dies. Not only are the bees informed of a death, but their hives are dressed in mourning. The literature of folklore is full of examples of such precautions to prevent the swarms from departing for new homes.

This custom once prevailed in the rural districts of New England, to which it had been brought from old England. Whittier wrote a poem called "Telling the Bees." A few stanzas run as follows:

> Before them [the hives], under the garden wall,
> Forward and back,
> Went drearily singing the chore-girl small,
> Draping each hive with a shred of black.

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[473] Dio Cassius 48.36–37.

[474] *Ibid.*, 48.37.4–5 (E. Cary's translation in the Loeb Classical Library).

Trembling, I listened: the summer sun
Had the chill of snow;
For I knew she was telling the bees of one
Gone on the journey we all must go!

Then I said to myself, "My Mary weeps
For the dead today:
Haply her blind old grandsire sleeps
The fret and the pain of his age away."

But her dog whined low; on the doorway sill,
With his cane to his chin,
The old man sat; and the chore-girl still
Sung to the bees stealing out and in.

And the song she was singing ever since
In my ear sounds on: —
"Stay at home, pretty bees, fly not hence!
Mistress Mary is dead and gone!"

A poem with the same title as Whittier's, but with the subtitle "A Colonial Custom," is to be found in a volume by Lizette Woodworth Reese: [475]

Bathsheba came out to the sun,
Out to our wallèd cherry-trees;
The tears adown her cheeks did run,
Bathsheba standing in the sun,
Telling the bees.

My mother had that moment died;
Unknowing, sped I to the trees,
And plucked Bathsheba's hand aside;
Then caught the name that there she cried
Telling the bees.

Her look I never can forget,
I that held sobbing to her knees;
The cherry-boughs above us met;
I think I see Bathsheba yet
Telling the bees.

Another literary reference to the custom is to be found in Mark Twain's *The Adventures of Huckleberry Finn:* [476]

[475] *The Selected Poems of Lizette Woodworth Reese* (George H. Doran Co., New York, 1926), p. 143. I am reprinting the poem here with the permission of the publishers. For this reference I am indebted to a friend, Mrs. Marjorie F. Gravit. [476] Chap. 8.

. . . And he [Negro Jim] said if a man owned a beehive and that man died, the bees must be told about it before sun-up the next morning, or else the bees would all weaken down and quit work and die.

In some parts of France, too, bees must be consoled after a death if they are to be kept from flying away, never to return.[477] In Germany the sad message is given to every beast in the stall as well as to every beehive.[478]

The custom of telling the bees about a death in the household is, therefore, widespread,[479] but it is also very old, as is clear from an epigram in the *Greek Anthology:* [480] "Ye Naiads, and ye cool pastures, tell the bees that start for their spring journeys that old Lysippus perished lying in ambush for the fleet-footed hares on a winter night." Since the beekeeper lived alone among mountains, the ceremony of telling the bees devolved upon the Naiads.

THE MANIKIN IN THE EYE

One of the most interesting omens of death is the departure of the manikin from the eye. A discussion of it will explain incidentally how the word "pupil" came to designate both a student and a part of the eye.

About half a century ago Jacob Grimm wrote: [481] "It is believed in Scotland to this day, that if you cannot see the mannikin in the sick man's eye, he is sure to die; the bystander's image is no longer mirrored in the lustreless pupil of the breaking eye."

The manikin in the eye is variously described. The Germans speak of "the little man in the eye" (*das Männlein im Auge*) and "the child" (*das Kindlein*); the Spaniards, of "the girl of the eye" (*la niña del ojo*). In Cuban Spanish "to rest the girl of the eye" (*descansar la niña del ojo*) means "to take a nap." The

[477] *Revue des traditions populaires*, 6 (1891) : 154.

[478] Wuttke, p. 459.

[479] Other references are Cook, A. B., *Journal of Hellenic Studies*, 15 (1895) : 23; Cox, p. 24; Henderson, pp. 309–310; Wright, as cited in note 368, pp. 281–282; *Folk-Lore Record*, 1 (1878) : 59.

[480] 7.717 (W. R. Paton's translation in the Loeb Classical Library).

[481] Grimm, Jacob, *Teutonic Mythology*, translated by J. S. Stallybrass (G. Bell and Sons, London, 1882–88), 3 : 1181. Grimm gives a good example of the belief from Anglo-Saxon. See also Lean, as cited in note 117, 2 : 579; Tylor, as cited in note 110, 1 : 431.

Latin word *pupilla* (cf. *pupa* and *pupula*) has descendants in Italian and English.[482]

Belief in this creature, which changes its sex and age, seems to be almost universal. The following lore of a bush tribe of tropical Africa is an aid in understanding Greek and Latin references to the "maiden" in the eye:[483]

> There is also a little being resident in the human eye. It is called the "child of the eye." This little person keeps a look-out for things going on in the world and reports everything that comes within ken to the people who dwell in the head. The little individual can be distinctly seen whenever one cares to look into the eyes of another. The pain in the eyes when a bit of grit or anything else gets into it, is caused by the efforts of this diminutive creature to turn it out. Were the ears and eyes not provided with these caretakers they would soon cease to be of any use to the head which grows them.[484]

In the classics there are no such circumstantial accounts of the activities of the beings in the eyes, but we do find Plato representing Socrates as asking Alcibiades whether he knows that, on looking into the eyes of another person, one sees as in a mirror the image of oneself, which is called "maiden." Alcibiades replies in the affirmative.[485]

According to some ancient natural philosophers, such miniatures were not to be seen in the eyes of persons fated to die within three days. Hope was abandoned when they could not be observed.[486] On the day on which the emperor Pertinax was killed neither the pupils nor the little pictures which they reflect were visible to those who looked for them.[487] As long as pupils reflected images, no matter how ill a patient might be, there was no danger of death.[488]

The meaning of this lore of the eyes has been worked out. It is

[482] I have derived the information of this paragraph from pp. 295–296, 299, of Smith, K. F., "*Pupula Duplex*," *Studies in Honor of Basil L. Gildersleeve* (The Johns Hopkins Press, Baltimore, 1902), pp. 287–300.

[483] Claridge, G. Cyril, *Wild Bush Tribes of Tropical Africa* (Seeley, Service & Co., London, 1922), p. 307.

[484] A strange Chinese story of inmates of the eye, "two tiny people, no bigger than a bean," is told by Smith, as cited in note 482, pp. 297–298.

[485] Plato, *Alc.* 1.133 A.

[486] Servius on Verg., *Aeneid* 4.244.

[487] Jul. Capitol., *Pertinax* 14.2.

[488] Pliny 28.64.

significant that a Greek poet speaks of "souls in the eyes of the dying" [489] and that Pliny places the seat of the soul in the eye.[490] A keen student of folklore says that the Greek and Latin words designating the maiden or pupil in the eye "undoubtedly go back to the time when they were applied in a literal sense to the soul which was seen in the man's eye." The same author continues: "When one dies, the mannikin, i.e. the soul itself, leaves the eye. Hence the origin of that immemorial custom of closing the open eyes of the dead, closing the door, as it were, upon the departed guest and insuring against the possible return of an occupant no longer welcome." [491]

The word "pupil" as applied to the eye has, therefore, a long and interesting history.

As an epilogue to this lore of the eye I should like to add a quotation which is neither science nor genuine folklore. In Thomas Dixon's *The Clansman* [492] the assailant of a mother and daughter is represented as being revealed by a microscopic examination of the dead mother's eyes. On the retina was etched "The bestial figure of a negro — his huge black hand plainly defined — the upper part of the face is dim, as if obscured by a gray mist of dawn — but the massive jaws and lips are clear — merciful God! — yes! — it's Gus!"

CURES FROM TOUCHING HANDS AND BODIES OF THE DEAD

There are persons who are supposed to be able to heal diseases by the laying on of hands; in death, however, the hands of all persons are endowed with curative powers.

Among English peasants we are told that it is not uncommon to seek the cure of diseases from the touch of a dead man's hand; and it is notorious in ecclesiastical annals that in Corfu the consecration of the bishop is effected by the imposition of the dead hand of St. Spiridion. . . .[493]

[489] Babrius 95.35: *ψυχαὶ δ'ἐν ὀφθαλμοῖσι τῶν τελευτώντων.*

[490] *Nat. Hist.* 11.145: "Profecto in oculis animus habitat."

[491] Smith, as cited in note 482, pp. 295–296.

[492] Book 4, Chap. 1. Kipling's tale "At the End of the Passage," one of the stories in *Mine Own People*, describes a doctor as taking photographs of a dead man's eyes.

[493] Wood, C. J., *Survivals in Christianity* (Macmillan and Co., New York and London, 1893), p. 228.

The directions of one of our own popular prescriptions run as follows: "If you have a goitre on your neck, rub a dead person's hand over it three times. As the body decays, the goitre will disappear." [494]

The ancients held that tumors and swellings and affections of the throat could be cured by touching the hand of a person who had been carried away by a premature death. Some of them said that any corpse would effect such cures, provided it was of the same sex as the sufferer and the back of the left hand was touched.[495]

Some persons have been of infinitely greater value to mankind as corpses than as living beings. A most potent remedy is contact with the body of a person who has committed suicide or been hanged. In Thomas Hardy's story of "The Withered Arm" [496] an afflicted woman is advised by Conjuror Trendle to "touch with the limb the neck of a man who's been hanged."

In ancient Rome it was believed that headaches could be relieved by applying to the temples the noose used by a suicide.[497] Under certain conditions the hair of a crucified person or a nail or piece of rope from a cross was useful in cases of quartan fever.[498]

Examples of the belief in the efficacy of touching corpses could be cited in such numbers [499] as to convince even the most skeptical that there has never been any interruption in the tradition.

[494] Thomas and Thomas, p. 105, No. 1218: cf. *Folk-Lore Record*, 1 (1878) : 48: "Not very long ago, in the neighbouring village of Storrington, a young woman afflicted with a *goitre* was taken by her friends to the side of an open coffin in order that the hand of the corpse might touch it twice. Mrs. Charles Standen of this place, who has for some years had an enlarged throat, on hearing that a boy was drowned in Waltham Lock, set off immediately and had the part affected stroked with the dead hand nine times from east to west, and the same number of times from west to east." Other examples are given on the same page.

[495] Pliny 28.45.

[496] *Wessex Tales*.

[497] Pliny 28.49.

[498] Pliny 28.41 and 46. See also 28.34; 34.151.

[499] Bergen, p. 131, No. 1247; Harland and Wilkinson, pp. 158–163; Hazlitt, as cited in note 50, 1 : 301; Henderson, p. 57; Lean, as cited in note 117, 2 : 583; Pettigrew, as cited in note 7, p. 100; Sir Walter Scott's "Advertisement to the Pirate."

AVOIDANCE OF WORDS MEANING "DEATH"

Under certain circumstances we avoid the use of the words "death" and "die." On tombstones "departed this life" is common. "Passed on" is another expression that has become frequent. When we use the word "obituary" we are employing a derivative from a Roman euphemism (*obiit*) for "died."

A Roman general once said: "Today I shall capture Letum." When he fell fighting rashly in battle, the Romans thought he was merely confirming his chance utterance, for *letum* as a common noun means "death." [500]

It is hard for us to appreciate to the full the effect of ill-omened words in antiquity,[501] but there is one piece of folklore that will help to make the ancient feeling clearer. When the word "fire" was spoken at a banquet the bad omen was averted by pouring water under the table.[502]

PART V: THE SPIRIT WORLD

Not even death itself puts an end to terrors, as Plutarch [503] long ago observed, for the imagination creates new ones for the soul to suffer in the other world and even to inflict upon the living. One may look forward to escape from the fears that beset one during life, but those beyond the portals of death are unending.

"DE MORTUIS NIL NISI BONUM"

A Latin phrase familiar to everyone, whether he knows Latin or not, is *De mortuis nil nisi bonum.* If we refrain from speaking ill of the dead it is from kindliness. In my boyhood I heard much criticism of preachers who felt compelled to eulogize the dead, even though there was nothing praiseworthy in their lives. This is an old story. Varro [504] asks how laudations can seem true

[500] Livy 41.18.11, 14; Val. Max. 1.5.9.

[501] On ill-omened words see Epictetus, *The Discourses* 3.24.89–91, and Frazer, J. G., on Ovid, *Fasti* 1.71.

[502] Pliny 28.26. [503] *De Superstit.* 4.

[504] *Sat. Men.* 376 (p. 201 in F. Buecheler's edition, Berlin, 1882): "Qui potest laus videri vera cum mortuus saepe furacissimus ac nequissimus civis iuxta ac P. Africanus?" Contrast Cic., *De Leg.* 2.25.63.

when the dead man was a thieving and worthless scamp. The Spartans called the dead king the best of all their kings.[505] Plutarch [506] says that "Praise is given also to that law of Solon which forbids speaking ill of the dead. For it is piety to regard the deceased as sacred, justice to spare the absent, and good policy to rob hatred of its perpetuity."

This explanation would not have satisfied Pliny the Elder. He asks why at mention of the dead the Romans aver that their memory has not been maligned.[507] It seems strange that he had no answer to his question. The reason lay in fear of the dead. "The spirits of vengeance were at one time the spirits of the dead." [508] Dead men tell no tales, but they have other means of doing injury. For this reason the emperor Titus was not much concerned about the slanders heaped upon his predecessors in office. He calmly remarked: [509] "As for the emperors who are dead and gone, they will avenge themselves in case anyone does them a wrong, if in very truth they are demigods and possess any power."

Since the spirits of the dead had great power of doing evil and since, as we shall see, they were endowed with a sense of hearing, it is clear that originally fear constrained people to say nothing derogatory of the dead. At the present time southern Negroes are not content with passive measures; they resort to flattery in order to keep spirits harmless.[510]

[505] Herod. 6.58.

[506] *Solon* 21.1 (B. Perrin's translation in the Loeb Classical Library). We are told by Diogenes Laertius 1.3, *Chilo* 2.69, that Chilo made it a precept that one should not speak ill of the dead. See Rohde, p. 202, note 115, for several other interesting references.

[507] *Nat. Hist.* 28.23.

[508] Nilsson, M. P., *A History of Greek Religion* (Oxford, At the Clarendon Press, 1925), p. 142. See also the chapter on "The Living and the Dead" in LeMarchant, A., *Greek Religion to the Time of Hesiod* (Sherrat and Hughes, Manchester, 1923), pp. 33–41; Paton, L. B., *Spiritism and the Cult of the Dead in Antiquity* (The Macmillan Co., New York, 1921), pp. 72–90.

[509] Dio Cassius 66.19.2.

[510] Puckett, N. N., *Folk Beliefs of the Southern Negro* (University of North Carolina Press, Chapel Hill, 1926), pp. 89–90.

DANGER FROM THE SPIRITS OF THE DEAD

A vivid illustration of the way the spirits of the departed may interfere with the living is to be found in *Black April*,[511] which I am quoting rather frequently, since, when superstitions are seen in their proper background, they seem more significant.

Black April's child is about to come into the world, but the father fears for the mother's life. His cousin has a set of birthing beads which their grandmother had brought from Africa. He crosses a swollen river in a dugout canoe in order to summon her. She protests that "It's a mighty black night"; that her crippled knee is painful; that the water is high. She is suspicious of his boat. But her protests and fears avail nought when Black April threatens: "Gramma'll hant you sho' as you fail me to-night!"

She replies, with as much resignation as she can summon: "I know I got to go, scared as I is. A boat on a floodin' river is a turrible t'ing, but I sho' don' want Gramma's sperit to git no grudge against me. . . . You wait till I git de beads out de trunk. Sometimes I wish Gramma didn' leave me dem beads. It's de truth!"

Much is made of fear of the departed in *Wuthering Heights*,[512] by Emily Brontë. One room of a mansion is so plagued by the spirit of a departed child that it is left unoccupied. A guest who is so unfortunate as to be put into it without the knowledge of the master spends a terrible night when Catherine, who has been "a waif for twenty years," returns to the window and tries to get in.[513]

Persons who through some untimely end had failed to fill out their allotted span of life might return as ghosts, sometimes to plague their murderers. Thus Shakespeare makes the ghost of Prince Edward say to King Richard the Third in a dream:[514]

> "Let me sit heavy on thy soul tomorrow:
> Think, how thou stabb'dst me in my prime of youth
> At Tewksbury. Despair, therefore, and die!"

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[511] Pp. 18–23. [512] Chap. 3.

[513] That ghosts are still active in England is shown in an interesting newspaper article by Wood, T. Porter, "The Boom in English Ghosts," *The New York Herald Tribune Magazine*, Dec. 28, 1930.

[514] *King Richard the Third*, V.iii.118–120.

When Richard awakes he is still troubled: [515]

> "The lights burn blue. It is now dead midnight.
> Cold fearful drops stand on my trembling flesh.
>
> . . . . . .
>
> Methought the souls of all that I had murder'd
> Came to my tent; and every one did threat
> To-morrow's vengeance on the head of Richard."

Beliefs of this character are to be found among Negroes:

> . . . The young moon was here. This was the time when all those who are cheated out of life come back and walk on this earth whenever a young moon shines. If Old Breeze had met with foul death, he'd come back that night and walk around that very pine as soon as the first dark came.[516]

The idea that dead persons may return to the scenes of their tragic deaths is widespread, for there are several castles and palaces in Europe which receive visits from ghosts of ill-fated human beings. "Among the famous ghosts who are still mentioned with awe figures the celebrated White Lady of the Hohenzollerns, who was supposed to appear in the old Royal Castle of Berlin, whenever a member of that family was about to die." [517]

Ghost lore appears frequently in Mark Twain's works.[518] I shall quote from but one story, *The Adventures of Huckleberry Finn*,[519] to show the necessity for carrying out prescribed rites of burial. Huck Finn thus explains Negro Jim's reasons for not wanting to talk about a man who had been killed: "He said it would fetch bad luck; and besides, he said, he might come and ha'nt us; he said a man that warn't buried was more likely to go a-ha'nting around than one that was planted and comfortable."

[515] *Ibid.*, 180–181, 204–206.

[516] *Black April*, p. 38.

[517] This is an extract from a newspaper thriller on "Ghosts That Haunt Royal Palaces," feature-fiction section of *The Detroit News*, Sunday, March 15, 1931. The story of the White Lady may be more conveniently consulted in Southwick, A. P., *Wisps of Wit and Wisdom* (A. Lovell and Co., New York, 1892), pp. 223–224. "Die weisse Frau" receives much attention in German lore. See Wuttke, pp. 29–32.

[518] See West, V. R., *Folklore in the Works of Mark Twain*, University of Nebraska Studies in Language, Literature, and Criticism, No. 10 (1930): 10–28; and also the tale of "The Golden Arm" in "How to Tell a Story," the first number in *How to Tell a Story and Other Essays* (Vol. 22 of the Hillcrest edition of *The Writings of Mark Twain*).

[519] Chap. 10.

In similar fashion the ancients experienced trouble with restless spirits which returned to earth and roamed about. They were placated by the Greeks at the festival of the Anthesteria and by the Romans at the Feralia and the Lemuria. The greatest peril, however, came from the ghosts of persons who had suffered a tragic or violent death and as a result observed no period of dormancy.

The ill-fated Hecuba revisited the world above as a specter because her body was sometimes lying on headlands and sometimes being tossed by waves. Her spirit lamented that she was unwept and unburied.[520] The ghost of the virgin Cleonice, who was mistaken by night and slain as an enemy, haunted the scenes of her death.[521] Through fear of the spirits of Romans slain at Pharsalia peasants refrained from disturbing the soil of the battle field and shepherds kept their flocks from grazing upon it.[522]

Perhaps the restlessness of unburied corpses is nowhere better illustrated than in a story concerning a fine deserted house at Athens. During the night a shackled emaciated figure used to roam through it, making a terrible noise with clanking chains. For this reason a philosopher was able to purchase the house at a bargain. While he was spending his first night in his new residence he had a frightful encounter with the ghost, but retained his presence of mind sufficiently to mark the spot where the ghost sank into the earth. The next day he had the place dug up and found bones with chains on them. They were collected and given proper burial, after which the house was left in peace.[523]

I shall not take time to pursue this aspect of my subject. Readers who have stout hearts may enjoy reading L. Collison-Morley's *Greek and Roman Ghost Stories*.[524]

[520] Eurip., *Hecuba* 1–54.

[521] Plut., *Cimon* 6.4–5.

[522] Lucan 7.860–865: cf. Petronius 122.137:

> "Ecce inter tumulos atque ossa carentia bustis
> Umbrarum facies diro stridore minantur."

[523] Pliny, *Epist.* 7.27.

[524] B. H. Blackwell, Oxford, 1912. Ghost stories from many ages and countries, including Greece and Italy, have been collected by Thompson, C. J. S., *The Mystery and Lore of Apparitions* (H. Shaylor, London, 1930).

GRAVES AND GRAVEYARDS

We are afraid of graveyards at night. They are headquarters for ghosts. Boys who have never hurried by them or made detours around them have great lacunae in their lives. One may not believe in ghosts, but that is no reason why one should not enjoy them.[525]

In *The Adventures of Tom Sawyer* [526] we learn that the dead have the power of hearing:

"Say, Hucky — do you reckon Hoss Williams hears us talking?"

"O' course he does. Least his sperrit does."

Tom, after a pause:

"I wish I'd said *Mister* Williams. But I never meant any harm. Everybody calls him Hoss."

"A body can't be too partic'lar how they talk 'bout these yer dead people, Tom."

Huck's attitude is like that of the ancients, who passed by graves of heroes in silence in order to avoid attracting the attention of the dead.[527] The ancient precaution of silence reminds one of a German saying: "Never call the dead by name, or you may *cry them up*." [528]

An interesting modern example of the restlessness of the departed that is caused by failure to get proper burial rites is given by Francis Parkman in *The Conspiracy of Pontiac*.[529] In May, 1763, an Englishman named Fisher was murdered by Indians on the Isle au Cochon within view of the defenders of Detroit.

For a modern collection of ghost stories see *The Haunters and the Haunted: Ghost Stories and Tales of the Supernatural*, edited by Ernest Rhys (D. O'Connor, London, 1921). Several interesting ghost stories are told in *The Gentleman's Magazine*, 44 (1855) : 58–59.

[525] That we do like ghosts is proved, I believe, by the great numbers of them in the short story. See French, J. L., *Ghosts, Grim and Gentle: A Collection of Moving Ghost Stories* (Dodd, Mead and Co., New York, 1927); Scarborough, D., *Famous Modern Ghost Stories* (G. P. Putnam's Sons, New York and London, 1921).

[526] Chap. 9.

[527] Scholium on Aristoph., *Aves* 1490; Photius, *s.v.* κρείττονες; Suidas, *s.v.* Ὀρέστης. See Rohde, p. 201, note 110.

[528] Grimm, as cited in note 481, 4 : 1811, No. 830.

[529] Chap. 11.

On the following day, several Canadians crossed over to the island to inter the body, which they accomplished, as they thought, very effectually. Tradition, however, relates as undoubted truth, that when, a few days after, some of the party returned to the spot, they beheld the pale hands of the dead man thrust above the ground, in an attitude of eager entreaty. Having once more covered the refractory members with earth, they departed, in great wonder and awe; but what was their amazement, when, on returning a second time, they saw the hands protruding as before. At this, they repaired in horror to the priest, who hastened to the spot, sprinkled the grave with holy water, and performed over it the neglected rites of burial. Thenceforth, says the tradition, the corpse of the murdered soldier slept in peace.

Sometimes more drastic measures are needed: [530] "The ghosts of murdered persons were supposed to walk until the bodies had been recovered and buried with Christian rites, and this being impossible in the case of suicides, a stake was driven through them when deposited at the crossroads to keep their ghosts down."

Perhaps no classical story illustrates the ancient conception of the necessity for proper burial more vividly than does that told of Polydorus by Vergil.[531] The shafts of the missiles with which he had been overwhelmed had grown into a thicket of cornel and myrtle. As Aeneas pulled up the shoots by the roots, drops of blood trickled from them and spotted the ground. When he tore up the third shaft with greater effort, a "tearful groan" (*gemitus lacrimabilis*) came from the ground beneath him, and he heard the corpse of Polydorus bidding him refrain from polluting himself, and to flee the cruel lands. Aeneas and his companions presently performed with great circumspection all the customary rites for the dead and put to rest the spirit of their hapless companion.[532]

Another cause for the appearance of ghosts is the expiation of injuries inflicted upon others. An example is to be found in *Hamlet:* [533]

> "I am thy father's spirit,
> Doom'd for a certain term to walk the night,
> And for the day confin'd to fast in fires,
> Till the foul crimes done in my days of nature
> Are burnt and purg'd away."

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[530] Lean, as cited in note 117, 2 : 595.

[531] *Aeneid* 3.22–68.

[532] I have already used this material in a note in *The Classical Weekly*, 20 (1927) : 129.

[533] I.v.9–13.

Like us, the ancients regarded an evil life as an excellent avenue to a restless ghosthood. The wicked were punished by an aimless wandering, a kind of exile, as it were. They proved a vain terror to the good, but molested the wrongdoers.[534]

GHOSTS AND COCK-CROW

If apparitions disturb us we may expect relief at cock-crow, as is clear from the actions of a representative ghost in *Hamlet:* [535]

Ber. It was about to speak when the cock crew.
Hor. And then it started like a guilty thing
Upon a fearful summons. I have heard,
The cock, that is the trumpet to the morn,
Doth with his lofty and shrill-sounding throat
Awake the god of day; and at his warning,
Whether in sea or fire, in earth or air,
The extravagant and erring spirit hies
To his confine; and of the truth herein
This present object made probation.
Mar. It faded on the crowing of the cock.

This superstition is given in its simplest form by Thomas Hood in the ballad called *Mary's Ghost:*

"The cock it crows — I must be gone!
My William, we must part!
But I'll be yours in death, altho'
Sir Astley has my heart." [536]

Another example of the belief is to be found in Robert Blair's poem, *The Grave:*

. . . horrid apparition, tall and ghastly,
That walks at dead of night, or takes his stand
O'er some new-open'd grave; and (strange to tell!)
Evanishes at crowing of the cock.

When cocks crow at other than their customary times the nights are free from ghosts, as we see from Shakespeare: [537]

[534] Apul., *De Deo Socr.* 15: cf. Isid., *Etym.* 8.11.101.

[535] I.i.147–157. See also I.ii.218–220, and *King Lear*, III.iv.118–119.

[536] In *The Gentleman's Magazine*, 44 (1855): 58, there is record of a beadle who was afraid to pass by a haunted house until the sun had risen.

[537] *Hamlet*, I.i.158–161: cf. Wuttke, p. 484: "Hahnenkrähen verscheucht alle Gespenster."

Some say that ever 'gainst that season comes
Wherein our Saviour's birth is celebrated,
The bird of dawning singeth all night long;
And then, they say, no spirit can walk abroad.

Even the devil is powerless at the sound of cock-crow. An amusing story is told on the Continent of how a farmer's wife tricked the devil by means of this spell. It appears that her husband was mourning the loss of his barn — either by wind or fire — when a stranger addressed him and said: "That I can easily remedy. If you will just write your name in your blood on this parchment, your barn shall be fixed and ready to-morrow before the cock crows; if not, our contract is void." But afterwards the farmer repented of the bargain he had made, and, on consulting his wife, she ran out in the middle of the night, and found a number of workmen employed on the barn. Thereupon she cried out with all her might, "Cock-a-doodle-doo! cock-a-doodle-doo!" and was followed by all the cocks of the neighborhood, each of which sent forth a hearty "Cock-a-doodle-doo!" At the same moment all the phantom workmen disappeared, and the barn remained unfinished.[538]

The power of the cock to rout a demon is illustrated in the accompanying drawing (Fig. 3) by a sixteenth-century artist.

The vanishing of ghosts at cock-crow is not a new characteristic, for they had learned to disappear at this time as far back as classical antiquity.[539] A most curious use of this belief is to be found in Prudentius, *Ad Galli Cantum*,[540] who makes a symbolic interpretation of this and other lore of the cock:

Ferunt vagantes daemonas
Laetos tenebris noctium
Gallo canente exterritos
Sparsim timere et cedere.
Invisa nam vicinitas
Lucis, salutis, numinis,
Rupto tenebrarum situ
Noctis fugat satellites.
Hoc esse signum praescii
Norunt repromissae spei;
Qua nos soporis liberi
Speramus adventum Dei.

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[538] Thiselton-Dyer, T. F., *The Ghost World* (J. B. Lippincott Co., Phila., 1893), pp. 355–356.

[539] Lucian, *Philops.* cf. 14. See also Eusebius, *Contra Hieroclem* 29 (Migne, *Patrol. Graec.*, Vol. 22, Col. 836); *Cat. Cod. Astrol. Graec.*, Vol. 3, App., p. 53; Boissonade, *Anecdota Graeca*, 3 : 445. I have not been able to check the last reference. For it and other helpful material I am indebted to Fehrle, Eugen, "Der Hahn im Aberglauben," *Schweizerisches Archiv für Volkskunde*, 16 (1912) : 65–76.

[540] Migne, *Patrol. Lat.*, Vol. 59, Cols. 779–780.

FIG. 3. A cock puts a demon to flight. From H. Bock, *Kreuter-Buch* (Strassburg, 1556), p. 403

Still another mention of this peculiar power of the cock is to be found in one of the hymns of St. Ambrose: [541]

Praeco diei iam sonat,
Noctis profundae pervigil,
Noctura lux viantibus,
A nocte noctem segregans.
Hoc excitatus Lucifer,
Solvit polum caligine,
Hoc omnis errorum chorus
Viam nocendi deserit.

THREATS FROM THE TOMB

From time immemorial it has been the custom for tombstones to admonish the reader. The advice is generally well meant, but sometimes epitaphs are of a threatening nature. The most famous one of modern times is, perhaps, that which tradition associates with Shakespeare:

Good frend, for Iesvs sake forbeare
To digg the dvst encloased heare:
Bleste be y^e man y^t spares thes stones,
And cvrst be he y^t moves my bones.

An ancient curse that was intended to protect a Cyprian grave reads as follows: "If anyone touches it, may he find the thunderbolt god angry, may he find the thunderbolt goddess angry; if anyone throws ordure on it, may he find the thunderbolt goddess angry." [542]

An Attic grave was protected by the following execration: [543]

I entrust the guardianship of this tomb to the gods of the lower world, Pluto and Demeter and Persephone and the Erinyes and all the other gods below. If anyone shall dismantle this tomb or open it or disturb it in any other way either personally or through the agency of another, may the land not be traversable for him nor the sea navigable, but may he and his whole race be exterminated. He shall experience all kinds of evils, both chills and tertian and quartan fever and skin disease. And whatever other evil and destructive things there are, may they befall the man who dares to take anything from this tomb.

[541] Migne, *Patrol. Lat.*, Vol. 16, Col. 1409.

[542] Le Bas, Philippe, et Waddington, W. H., *Voyage archéologique en Grèce et en Asie Mineur . . . pendant années 1843 et 1844* (Didot, Paris, 1847–48). The inscription is No. 2739 in the volumes on *Inscriptions grecques et latines . . .*, Vol. 3, Part II.

[543] *Corpus Inscriptionum Graecarum*, I, No. 916: cf. No. 989.

Perhaps the most potent sepulchral curses are those which safeguard the sleep of the Pharaohs. The death of Lord Carnarvon was popularly attributed to his part in the discovery of the resting place of King Tutankhamen. It is now the fashion to ascribe to ancient malevolent curses the death of anyone associated with the finding of the tomb or with the guarding of the relics.

Roman sepulchral inscriptions seldom resorted to violent curses. In general they expressed a more or less stereotyped request that no desecration be done to the graves. The formula "Huic monumento dolus malus abesto" might be abbreviated to "Huic mon. dol. mal. abesto," or even to the still more perfunctory "H·M·D·M·A." A little more originality is shown in the inscription which invokes upon the violator of the grave the same fate which the entombed has suffered.[544] Still another asks the reader in the name of the gods above and below not to wish to do injury to the ossuaries.[545]

LOSS OF MEMORY FROM READING EPITAPHS

A most peculiar superstition about the tomb is to be found in Clifton Johnson's *What they Say in New England:* [546] "Read gravestone epitaphs, and you will lose your memory." When I ran across this sentence I could hardly believe my eyes, for in his *Essay on Old Age* [547] Cicero makes Cato say: "Nor do I fear that on reading epitaphs I shall lose my memory, as they say." This belief is given in Lean's *Collectanea.*[548] Both Lean and Brewer [549] call it American, but it seems to be strictly bookish.

So far as I know, nobody has been able to do more than make absurd guesses about the origin of this belief. The loss of faculties

[544] *Corpus Inscriptionum Latinarum*, VI, No. 7308.

[545] *Ibid.*, XIV, No. 2535: "Per deos superos | inferosque te rogo ne | ossuaria velis violare. . . ." See Martin, Henry, "Provisional Oaths of Inscriptions," *Trans. and Proc. Am. Phil. Assn.*, 43 (1912) : xlix–li.

[546] P. 79 (as cited in note 214).

[547] 7.21. Lean records an interesting comment: "One would rather say that he [the reader of epitaphs] would lose his faith, remembering the Italian proverb, 'E più bugiardo che un epitaffio.'" [548] 2, Part II, 598.

[549] Brewer, E. C., *The Reader's Handbook* (Cassell & Co., London, Paris, and New York, 1885), p. 1084.

is mentioned very frequently in ancient folk tales. One might make a rash guess that some tombstone inscription threatened an impious or irreverent reader with loss of memory.

COMMUNICATION WITH THE DEAD

In modern times friends and relatives of deceased persons have been trying to establish communication with the spirits of the departed. According to newspaper reports, the family of Sir Conan Doyle is still (1931) expecting to get messages from him. The ancients were more successful:

> Thus in a famous story of Herodotus,[550] Periander, tyrant of Corinth, sent to an oracle of the dead to ask a question of his wife's ghost. She replied that she was cold for want of clothes and would not answer, until she was properly provided. Periander thereupon stripped the ladies of Corinth of their finery and burned it; his wife was then satisfied and gave him the required information. Similar is the theme of a parody of such stories in Lucian, where the ghost of a dearly beloved wife appears to the husband to complain that one of her slippers, which had fallen behind a chest, had been overlooked and had not been burned at her funeral.[551]

RECOGNITION OF FRIENDS IN THE OTHER WORLD

One of the yearnings of the human soul is that there may be recognition of friends in the other world. As a boy I heard sermons preached on the subject, but I remember only the fact of having heard them. This hope has been expressed through the ages. Cicero puts these words into the mouth of Cato: "I am carried away by the desire of seeing your fathers, whom I loved and cherished, and I am eager to meet not only those whom I have known, but also those of whom I have heard and read and even written." [552]

In this paper I have devoted most of my attention to superstitions connected with various periods of human life, but it is only a small contribution to the general subject of survivals. There are many other ancient superstitions which have never withdrawn their talons from human society.

Cicero asks: [553] "What old woman is there so silly as to fear the things which you yourselves would fear if you had not learned

[550] 5.92.7. [551] Halliday, pp. 50–51.
[552] Cicero, *De Sen.* 23.83: cf. Plato, *Apol.* 32.41. [553] *Tusc. Disp.* 1.21.48.

natural philosophy?" The cure for superstition lies in education,[554] but the passage of the centuries has failed to make reasoning easier than credulity. The oddities of the mental furniture of our remote ancestors constitute our most imperishable heirlooms.[555]

James Russell Lowell says in rather picturesque language:[556] "A superstition, as its name imports,[557] is something that has been left to stand over, like unfinished business, from one session of the world's *witenagemot* to the next." There is still much unfinished business of this kind listed in the world's agenda and one dares not venture to predict the time when it will be disposed of.

There is always danger that papers of this character may seem to belittle the achievements of the Greeks and Romans, but I think that they really do the opposite thing. They show the originality of the adventurous spirits who were not satisfied with tradition, but set out to establish logical relations of cause and effect. Everyone who enjoys the advantages of European civilization is indebted to the spirit of scientific inquiry which the Greeks developed and fostered.[558]

University of Michigan

[554] Cf. Cicero, *De Fin.* 1.19.63: "Omnium autem rerum natura cognita, levamur superstitione, liberamur mortis metu, non conturbamur ignoratione rerum. . . ."

[555] An interesting reference in this connection is Randolph, Vance, *The Ozarks: An American Survival of Primitive Society* (The Vanguard Press, New York, 1931). Chapter V (pp. 87–137) is devoted to "Signs and Superstitions."

[556] In his essay, *Witchcraft.* Cf. Wuttke, p. 6, on the meaning of *superstitio:* ". . . eigentlich eine Ansicht, welche aus einer früheren, geschichtlich bereits überwundenen, niedrigeren Stufe religiöser Weltanschauung zurückgeblieben ist."

[557] Of course, the etymology here given is merely a guess. One can find no basis for it in anything Roman. See the *New English Dictionary, s.v.* "Superstition."

[558] It is a pleasure to me to acknowledge the great help I have received from Mrs. John Harrod Foster, of the Plimpton Press, who refuses to take anything for granted. After I had given the manuscript a complete checking, she detected a number of the exasperating little mistakes and inconsistencies that are so agile in insinuating their way into works of this kind. To her feeling for the niceties of English I am indebted for several improvements in the phrasing of sentences.

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Owing to increasing interest in the study of folklore survivals from antiquity it seems worth while to collect and organize enough of the references to the scattered literature of the subject to provide a working minimum. A special effort has been made to keep these lists from becoming cumbersome, but I doubt not that even with this restriction there are rather serious omissions. It is obviously impossible to undertake to mention articles and dissertations that do not fall strictly within any of the six sections I have made.

In Section I no publications are included which do not make a definite effort to associate the present with the past. Sections II and III are intended to give one access to the material in individual classical authors who are rich in folklore. Sections IV and V list systematic treatments of classical folklore and magic. They contain only a few items, but, with their references, they open up an enormous amount of material. The scholar who ransacks the works included in Sections II–V will find many parallels and some examples of indebtedness in any large collection of modern folklore of peoples of Indo-European stock. Section VI endeavors to do for modern literature what Section II does for Greek and Latin, but I have been able to find only a few items, although many authors, especially novelists, employ folklore to impart local color.

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THE HYDROGRAPHIC REGIONS OF MICHIGAN

CHARLES M. DAVIS

THE pattern which the drainage system of an area makes upon the surface of the land is a prominent feature of the landscape. It affects the distribution of human habitations and the lines of communication. Of those primary human necessities which are limited in extent, water is one of the most important and its distribution profoundly influences human activities.

This classification of the drainage-system patterns of Michigan is based upon the form of the pattern as seen on a map, and not upon the characteristics of the stream valleys. A youthful stream may be a part of a mature pattern. Most of the drainage of Michigan is youthful in form, but its pattern is mature.

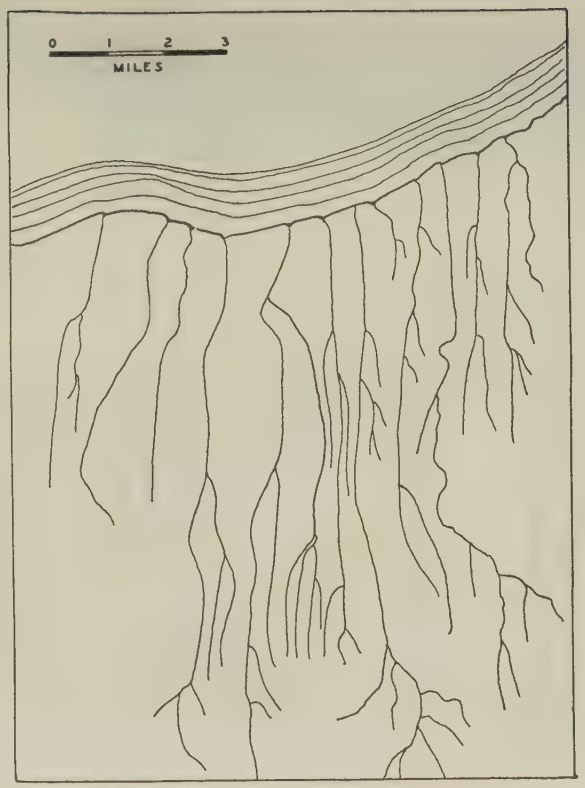
The pattern formed by streams and lakes is determined by many factors. The slope of the land surface, the soil material and the underlying rocks all affect stream courses. The drainage pattern is not a static thing. At almost any place along courses of streams can be seen the scars of earlier cutting. The pattern of a stream system today is probably different from what it was in the past and from what it will be in the future. The age of a stream is not a matter of time alone, but of the relative completion of the work to be done. A stream flowing over sandy drift quickly cuts down to base level and begins to meander, whereas an equally rapid stream flowing over hard rock may take hundreds of times as long to accomplish the same result. Lakes, too, are not constant in form. They are attacked by vegetation which fills up their beds and by streams whose headwaters cut back and may drain the lakes. Each drainage system has an individual configuration, yet these systems form distinguishable types. It is possible to pick out areas in which the drainage pattern is essentially similar throughout. Such areas may be called hydrographic regions.

The surface features of Michigan are largely the result of the advance and retreat of the continental glaciers. In a few places the glaciers have scoured and scraped, leaving the rock bare, but generally they have deposited. The immense amount of material carried by the glaciers has been dumped on the surface in a system of moraines and outwash plains, river beds and lake plains. The stream patterns are in a large degree consequences of this deposition.

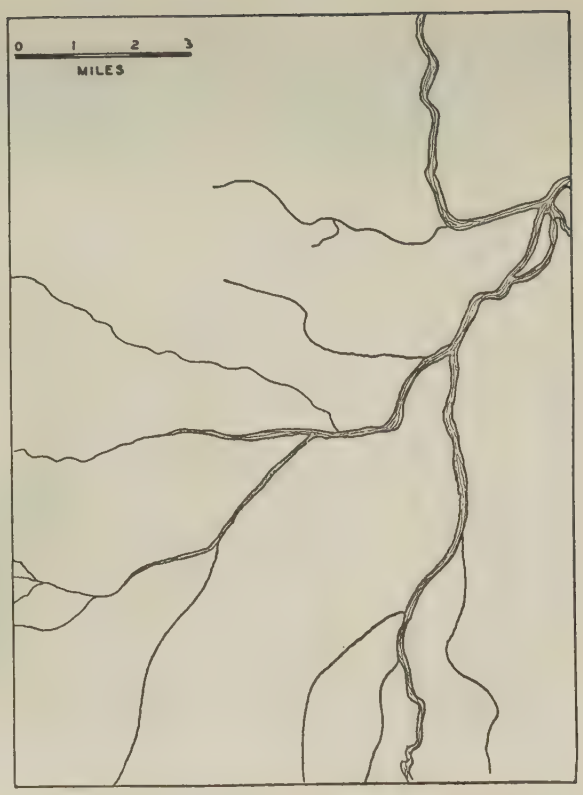
The streams must make their way across the irregularities of such a surface as best they can. They must swing around moraines, fill up basins, lose themselves in swamps, and everywhere depart from straight and direct courses to outlets. Notwithstanding these difficulties they have in most places developed patterns which can be recognized, in spite of irregularities, as dendritic types. In such patterns the stream and its tributaries resemble the veins in a leaf, with the tributaries joining the main stream at angles of approximately forty-five degrees. This pattern exemplifies most of the drainage systems found in Michigan, which are present in youthful and mature stages.

Youthful dendritic patterns are found where streams flow from a highland area to the lakes without crossing an extensive lowland. Such streams maintain in almost straight courses their individual channels from headwaters to outlets. They have not developed into systems of main and tributary streams. The resulting pattern is one of many parallel straight channels with few tributaries except at the headwaters on the highlands (Map 3 A). A region of this type of pattern is found along the northern shore of the Northern Peninsula from the state boundary to Keweenaw Bay. In the Southern Peninsula it is found along the eastern shore of the "Thumb." These littoral bands of youthful drainage pattern include some streams which have developed extensive mature dendritic patterns on the surface of the uplands, but where they descend the slopes to the lowlands they are similar, except for volume, to the rest of the youthful drainage system.

The streams which compose the more mature dendritic patterns have acquired tributaries by the cutting back of their headwaters and by the capturing of other streams (Map 3 B). They have de-

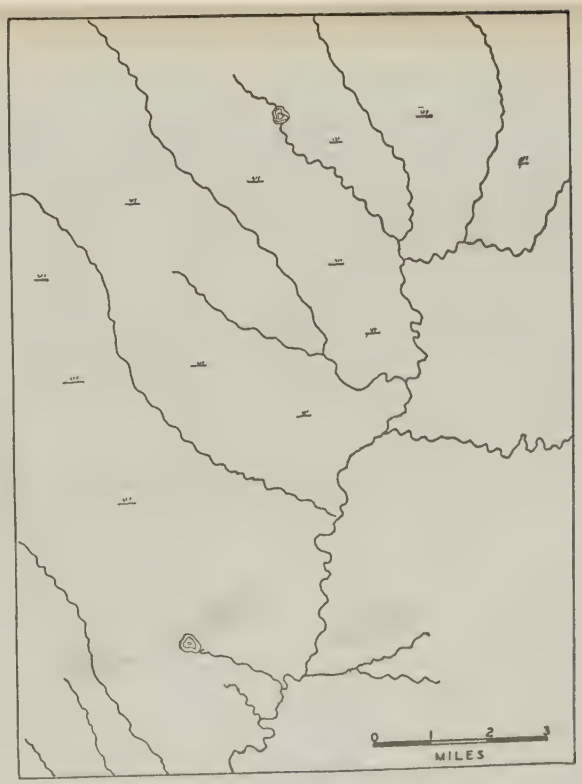


A. Youthful dendritic pattern, northern Ontanagon County



B. Mature dendritic pattern, the Saginaw River near St. Charles

C. Incomplete pattern, lake type, near Pontiac



D. Incomplete pattern, swamp type, the Manistique in Schoolcraft County

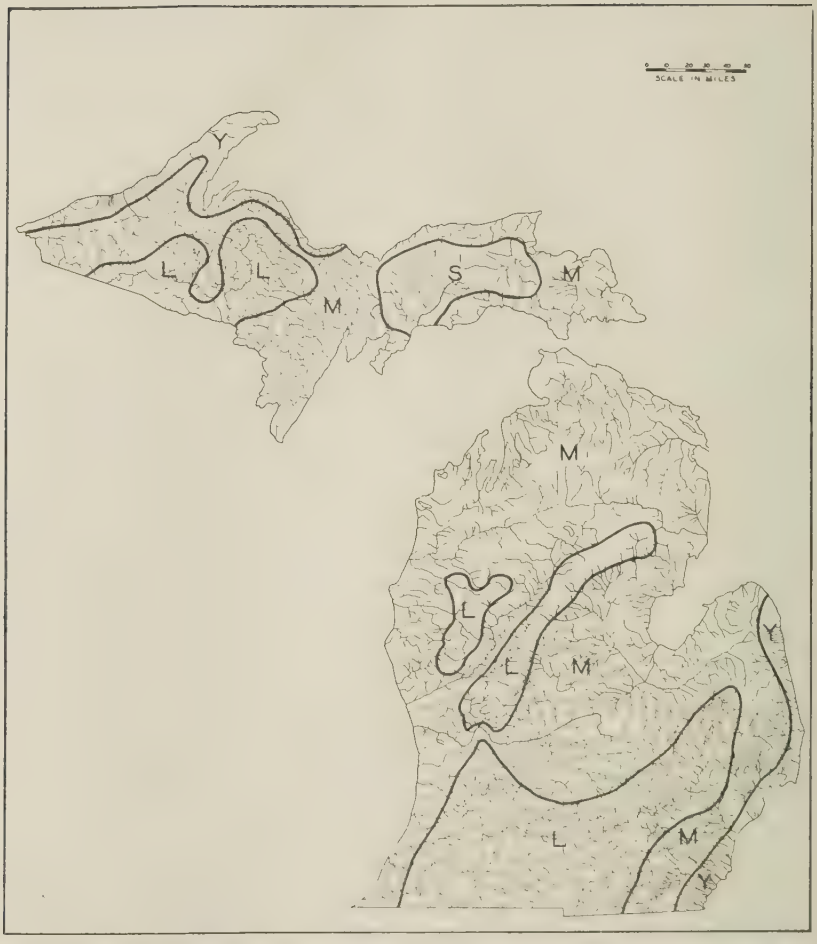
MAP 3. Drainage pattern types

veloped toward the ideal leaf-vein pattern, but have been forced into irregularities by the nature of the surface. Their tributaries have not developed with equal speed; one may be mature and another young. Across lake beds they may develop meanders, cut-offs and ox-bows, every indication of old age, whereas a mile upstream they may be young.

Though the nature of the stream valley influences the pattern but little, the irregularities of the surface affect it greatly. The Saginaw River, flowing across a fairly level lake bed, has formed in its upper course a typical mature pattern. In its lower course, however, its two principal tributaries, the Cass and the Tittabawassee, have been trapped behind moraines and bent far upstream. From this morainic bar they escape only at the gap where the Saginaw itself flows through the moraine. The Black River, in Sanilac and St. Clair counties, is limited sharply on the east by a moraine. On this side it has developed few tributaries whereas on the western side there is a fairly normal pattern. At the first break in the moraine it turns to the east and empties into the lake. Such deviations from the ideal type of the mature dendritic pattern might be repeated for many streams. In solving the intricacies of its progress each has formed a pattern more or less like the ideal model. Most of the surface of the Lower Peninsula is covered by mature dendritic drainage patterns. The Saginaw, the Grand, the Au Sable, the Manistee, the Thunder Bay, the Black and the Boardman are all of this type.

In some places the difficulties of the glaciated surface are too great to permit the streams to drain the areas completely. This results in incomplete drainage patterns. These are of two kinds: the lake type and the swamp type.

The lake type is one in which there are numerous small lakes, swamps and bogs connected by more or less permanent streams. The land between the lakes and swamps is usually dry. Such a type may be recognized by the freckled appearance which the many lakes give to a drainage map (Map 3 C). This pattern is always associated with moraines of the knob-and-basin variety. A region of this incomplete drainage covers Gogebic County along the Wisconsin boundary, parts of Iron and Baraga counties, and



MAP 4. Hydrographic regions of Michigan. *L*, incomplete drainage, lake type; *M*, mature dendritic areas; *S*, incomplete drainage, swamp type; *Y*, youthful dendritic areas

most of Marquette County. In the Southern Peninsula a region of this drainage occurs with the moraines which border the lowland around Saginaw Bay. This extends southward to include most of the southern boundary of the state.

The second of the incomplete drainage patterns is the swamp type. This occurs on flattish surfaces of ground moraine where the gradient is not sufficient to carry off water rapidly. Precipitation sinks into and percolates through the sandy soil instead of running off the surface. The rivers which drain areas of this type lack the power to carry off the water and are broad, shallow and slow. They are of mature dendritic pattern and meander in their channels, seeming to stagger under the load of water from an area which they cannot completely drain. They develop few tributaries and are fed from the marshy ground through which they flow. The Manistique is the best example of such a river, and its basin, most of Schoolcraft County, together with the headwaters of the Taquamenon, is a region of this pattern (Map 3 D).

The distribution of drainage-pattern types in Michigan is determined largely by the surface features of glacial deposition. The youthful dendritic pattern is found on the slopes of the uplands, and the more mature pattern on the flatter surfaces. The incomplete drainages are associated with moraines; the lake type with terminal moraines; and the swamp type with ground moraines. The accompanying map shows the areal distribution of the different types (Map 4).

University of Michigan

A PRELIMINARY CLASSIFICATION OF THE MAJOR TERRESTRIAL ECOLOGIC COMMUNITIES OF MICHIGAN, EXCLUSIVE OF ISLE ROYALE

LEE R. DICE

THIS proposed classification of the terrestrial ecologic communities of Michigan is based on the assumption that most kinds of animals and plants are dependent directly or indirectly on the same dominant environmental factors, and that, therefore, a classification of the more important ecologic communities can be devised which will be useful for all or nearly all groups of organisms. It has not yet been demonstrated that such a classification can be developed, and, so far as I know, this is the first attempt to devise for a geographic unit as large as a state an ecologic classification including both plants and animals.

It will be readily admitted that a classification of the minor ecologic communities should be different for each different group of animals or plants. The environmental factors affecting an insect which lives inside a plant stem most of its life are certainly different from those affecting a large carnivorous mammal. Nevertheless, the occurrence of the insect in a given place is dependent at least in part on the occurrence of its preferred food plants, and the occurrence of the carnivorous mammal is also dependent upon the presence of its prey, which in most cases will be herbivorous species adapted for life in particular vegetation types. The presence of a particular type of vegetation may, therefore, very well indicate general conditions favorable both for the insect and for the mammal. Ignoring the minor variations I shall attempt, then, to indicate those ecologic communities which in Michigan are believed to be most important for the life

of organisms. In general, these communities are characterized by vegetation and soil types.

A large proportion of the studies of ecologic communities carried on in Michigan has dealt only with plants, and the plant communities are, therefore, much better known than the animal communities. A few studies of mammal communities have been published, but for other groups of animals little ecologic information is available. As more information becomes accessible about the ecologic relationships of both plants and animals the classification here proposed will certainly be greatly altered. It is with the hope of directing attention to the need for classifying natural environments that the following tentative list of communities is published.

For convenience the several ecologic communities in each biotic province in Michigan are arranged more or less arbitrarily in several groups, which are in the main successional sequences. No attempt is made, however, to show all the successional relationships, and a community listed in one group is not repeated even though it be a very important successional stage in another sere. No attempt is made to list the intermediate stages between the major communities.

The appended bibliography is intended to include all titles which employ any kind of formal classification for any of the ecologic communities of the state of Michigan, or which describe in ecologic terms the vegetation of any part of the state. The list as given is undoubtedly incomplete, but all important references available have been included.

The base for the map showing the distribution of the biotic provinces in the state was kindly furnished by the Geological Survey of Michigan.

BIOTIC PROVINCES OF MICHIGAN

(Map 5)

For the purpose of this study the state of Michigan is divided into three biotic provinces. The southern part is considered to belong to the Ohioan Biotic Province; the part of the Southern

Map 5. Distribution of the three biotic provinces in Michigan

Peninsula to the northward of this region and all of the Northern Peninsula are considered to belong to the Alleghanian Biotic Province.

The boundary between the Ohioan and the Alleghanian biotic provinces stretches across southern Michigan from Lake Michigan to Lake Huron. The exact position of the boundary is indefinite and might with almost equal reason be drawn a number of miles north or south of the location adopted in this paper. The general criterion here adopted for determining the position of this boundary is the northern limit of dominance of the oak-hickory community and the southern limit of dominance of the white and Norway pine community. Both these communities are successional stages in the development of the sugar-maple forest. The sugar-maple forest is the climatic climax dominant in both the Ohioan and Alleghanian regions, though the climax forest is not exactly alike in the two regions.

An arm of the Ohioan (usually called the Carolinian) is considered by many writers to extend northward along the eastern shore of Lake Michigan for a considerable distance. Although it is true that a number of southern species of both plants and animals do extend their ranges northward along the shores of Lake Michigan and Lake Huron, it is also true that some northern species extend theirs southward along the same lake shores, particularly along Lake Michigan. This is a further illustration of the amount of overlapping of northern and southern elements along the boundary between the Ohioan and Alleghanian regions.

Notwithstanding the amount of overlapping between the Ohioan and Alleghanian regions in Michigan it is desirable for purposes of classification to establish a definite, though highly arbitrary, boundary between them. Actually, the position established for this boundary should be interpreted to indicate more or less the central location for a broad belt of intergradation. Arbitrarily, then, the counties of Sanilac, Lapeer, Genesee, Shiawassee, Clinton, Ionia, Kent, Muskegon and Oceana are assumed to constitute the northern limits of the Ohioan Biotic Province in Michigan.

Politically Isle Royale belongs to Michigan, but this island

lies close to the northern shore of Lake Superior, and is more similar in its fauna and vegetation to the adjacent parts of Ontario than it is to northern Michigan. It represents, therefore, a third biotic province, the Canadian.

Ohioan Biotic Province

Southern Michigan is in the same biotic province as Ohio, and for this province the name "Ohioan" is hereby proposed. The faunal division covering this geographic area has in the past usually been combined with the Piedmont Plateau of the eastern side of the Appalachian Mountains, to form the Carolinian faunal district. There are, however, important differences in fauna and flora and in vegetation type between Ohio and southern Michigan and the piedmont district of the Carolinas, and, therefore, it seems desirable to distinguish the Ohioan Biotic Province from the Carolinian. There is, unfortunately, little information available about the ecology of eastern North America, and the limits of the Ohioan province cannot be determined at this time.

The Ohioan province is characterized by its deciduous forests. Hard maple and beech form the climax association. Oaks and hickories are a very important successional stage, persisting on sandy or gravelly soils perhaps indefinitely. The pines are of only slight ecologic importance, forming a successional stage only on the sand dunes along Lake Michigan.

Aquatic Succession

Water lily community. — This community is characterized by the floating leaves and flowers of the several kinds of water lilies (Nymphaea and Castalia).

Pondweed community. — The most conspicuous members of the community are the various species of pondweed (*Potamogeton*), but there are many other associated floating plants.

Reed marsh community. — The growths of cat-tail, bulrush, other rushes and similar kinds of coarse vegetation usually partly submerged in water make up this community.

Sedge marsh community. — Numerous kinds of sedges and simi-

lar kinds of plants growing at the edge of the water or in very wet places make up the sedge marsh community.

Meadow community. — In the meadow the sedges are replaced in general by grasses. Originally, in southeastern Michigan there were a number of natural meadows produced by the filling in of beaver ponds and glacial lakes, but these were only a temporary stage and the meadow was quickly replaced by shrubs and forest, except where fires prevented the occurrence of woody vegetation. In southwestern Michigan, nearer the region of prairies, natural meadows were undoubtedly much more persistent.

Prairie community. — Under natural conditions extensive areas in southwestern Michigan were probably covered by prairies, since this region is directly continuous with the prairie region of Illinois. Elsewhere in Michigan true prairies were probably absent.

Buttonbush swamp community. — The buttonbush (*Cephalanthus occidentalis*) frequently dominates extensive areas in and about shallow ponds and lakes. Commonly associated forms are Ilex, Sambucus and Viburnum.

Red osier and willow thicket community. — Most common along the shores of streams and small lakes, but common also about the edges of marshes and meadows. Alders sometimes are associated with the willows.

Flood-plain forest community. — This is a high forest dominated by such trees as the elms, ashes, soft maples, sycamore, birch, basswood, black walnut, butternut, swamp oak and tulip tree. Included here is the stage of soft maples and yellow birch sometimes found to follow the tamarack bog.

Sugar maple and beech community. — The climax forest of southern Michigan is dominated by sugar maple and beech. It is a high forest with heavy shade.

BOG SUCCESSION

Floating-sedge mat community. — The chief plant is *Carex filiformis*. Commonly associated forms are other sedges and sphagnum.

Leatherleaf community. — The dominant plant is the leather-

leaf (*Chamaedaphne calyculata*). Numerous other shrubs and herbs are commonly associated. Sphagnum is nearly always present and in places may occur with only scattered shrubs.

Tamarack bog community. — In southern Michigan the tamarack (*Larix laricina*) is the characteristic bog tree; the black spruce is seldom found.

SAND SUCCESSION

Moving sand community. — Best developed on the dunes along Lake Michigan.

Fore-dune community. — The dune grass Ammophila is a pioneer in holding the dune sand. Such shrubs as the willow and sand cherry are also important in this community.

Cottonwood dune community. — The cottonwood (*Populus deltoides*) is the most important tree.

Pine dune community. — Many dunes along Lake Michigan are covered by a forest of pine, usually jack-pine (*Pinus banksiana*), but sometimes white pine (*Pinus strobus*). The ground is usually covered by Arctostaphylos and other heaths and by creeping juniper. The growth of heaths often precedes the appearance of the pines.

Basswood dune community. — The basswood (*Tilia americana*) is the characteristic tree. There is a thick growth of other trees and shrubs.

Black oak dune community. — Dominated by the black oak (*Quercus velutina*).

Oak and hickory forest community. — Extensively developed throughout southern Michigan, especially on sandy and gravelly ridges. On very poor soils this community is probably only very slowly, if ever, replaced by hard maple and beech forest.

FIRE AND CLEARING SUCCESSION

Weed community. — I have been unable to find an adequate description of the first successional stages that follow destructive fires in southern Michigan, but presumably the first stage would be dominated by herbs or weeds, as is the case in most other regions.

Bramble community. — Blackberries and other shrubs often form rather dense thickets on cleared or burned land.

Aspen community. — In southern Michigan the aspen community is not nearly so extensive or important as it is farther north, but many small stands of quaking aspen formerly occurred.

Oak opening community. — Oak openings were originally very extensive in southern Michigan. In them the black oak (*Quercus velutina*), burr oak (*Quercus macrocarpa*), and sometimes other oaks, grew in a parklike stand. The ground was often covered with hazel brush (Corylus). It has been presumed that some at least of these oak openings were maintained by the frequent fires.

Second-growth hardwood forest community. — Nearly all the woodlots of southern Michigan at the present time are second growth; the original trees and many of the shrubs have been destroyed by clearing and pasturing.

COMMUNITY OF THE AIR

Aërial community. — Made up of those animals which mate or feed in the air.

EROSION COMMUNITIES

Sand beach community. — Found extensively along the shores of large lakes.

Gravel beach community. — Not so common as the sandy beach.

Mud bar community. — A freshly deposited mud bar is quickly occupied by vegetation, with a shrubby or herbaceous community ultimately developing.

Forested shore community. — A considerable number of animals and a few plants are characteristic of the eroding shores where forest or shrub formations meet the water of rivers or small lakes.

Cut-bank and bluff community. — Where rivers are undercutting their banks or where the waves of large lakes are producing bluffs on clay hills, the exposed soil produces conditions favorable for some insects and some birds. Characteristic of such situations are the red cedar (*Juniperus virginiana*) and creeping juniper (*Juniperus communis*). The sumacs (Rhus) may form nearly pure stands on some types of eroded areas.

ARTIFICIAL COMMUNITIES

Edificarian community. — Occupies the habitat in and closely associated with the buildings erected by man.

Orchard and park community. — Widespread in southern Michigan.

Cultivated field community. — Varies in environmental conditions according to the kind of crop cultivated.

Pasture community. — This is the most natural of the artificial communities, but owing to heavy pasturage many native species of plants and animals have been eliminated from most pastures.

Ruderal community. — Occupies the habitat formed by waste lands along roads and in abandoned fields.

Alleghanian Biotic Province

The Alleghanian province (Agassiz, 1854, p. 362) occupies in Michigan the northern part of the Southern Peninsula and all of the Northern Peninsula. Although differing in some respects from the Alleghanian province as found in New England, New York and Pennsylvania, the differences seem hardly sufficient to justify the recognition of a Lake Forest Province (Weaver and Clements, 1929, p. 440). Future ecologic studies may show that such a division is desirable.

In Michigan the chief ecologic characteristic of the Alleghanian Biotic Province is the extensive development of the pines (*Pinus strobus, P. resinosa* and *P. banksiana*), which form very important successional stages, sometimes long maintained, and which perhaps in some situations may never be followed by hardwood forest. The hardwood climax forest is dominated by the hard maple, with which are associated in varying abundance the beech, hemlock, yellow birch, basswood and elm.

AQUATIC SUCCESSION

Water lily community. — Seems to be similar to the same community found in the Ohioan province.

Pondweed community. — Perhaps not quite so luxuriant as in the warmer waters of southern Michigan.

Reed marsh community. — Rushes, cat-tail and similar sorts of vegetation.

Sedge marsh community. — Many extensive areas.

Meadow community. — Probably not very extensive in northern Michigan, except where the normal succession of shrubs or trees has been destroyed by fire, pasturage or clearing.

Lowland thicket community. — Characterized by a thick growth of such hydrophytic plants as the willows, alders and dogwood. Young trees of the succeeding lowland forest are usually present.

Lowland hardwood forest community. — In very wet soil the black ash (*Fraxinus nigra*) may form nearly pure stands. In better drained situations there occurs a mixture made up of hard maple, elm, black and white ashes, and yellow birch. Frequently the conifers, balsam, hemlock, white pine and arbor vitae are found mixed with these hardwoods. I include in this community the border of red maple and other hardwood trees, which often is transitional between the bog and the lowland forest.

Hemlock community. — Hemlock (*Tsuga canadensis*) frequently forms nearly pure stands of large trees on fairly well drained flat land or on gentle moist slopes, especially northern ones. I place in this community the occasionally occurring stands of balsam (*Abies balsamea*) and white spruce (*Picea canadensis*). These species are sometimes associated with hemlock, but on the Michigan mainland they do not often form an important part of the community. In the Canadian province, however, fir and spruce are much more important ecologically.

Sugar maple community. — As shown by Gleason (1925, pp. 285–296), the characteristic tree of the hardwood forests of the northern part of the Southern Peninsula of Michigan is the hard maple (*Acer saccharum*). Other trees commonly associated with the hard maple are the beech (*Fagus grandifolia*), yellow birch (*Betula lutea*), basswood (*Tilia americana*) and elm (*Ulmus americana*). Hemlock (*Tsuga canadensis*) is frequently found also in this forest, but there seems to be little reproduction of the hemlock; when the trees now living die, hemlock will be absent from the community.

On dry ridges the hardwood forest is made up mostly of sugar

maple, yellow birch and basswood; in more moist areas the elm, beech and hemlock are often commonly associated species.

BOG SUCCESSION

Floating-sedge mat community. — The sedge (*Carex filiformis*) is the characteristic plant.

Leatherleaf community. — Leatherleaf is the dominant plant, but there are numerous other shrubs and herbs, and usually much sphagnum moss.

Black spruce and tamarack community. — The black spruce (*Picea mariana*) is commonly associated with tamarack in the bogs, but occupies a slightly less wet situation.

Arbor vitae community. — The arbor vitae (*Thuja occidentalis*) dominates extensive areas of low wet ground in northern Michigan. Here included is the Pyrus-Vaccinium thicket association of Gates (1912, p. 62), which apparently is made up typically of a narrow line of high shrubs bordering the arbor vitae community.

SAND SUCCESSION

Moving sand community. — Extensive areas of dunes occur at various places along the shores of the Great Lakes.

Fore-dune community. — Growths of grasses and shrubs of importance in capturing the moving sand.

Jack-pine community. — The jack-pine dominates extensive areas throughout all of northern Michigan. Unless the stand of pines is too thick the ground is usually covered by a growth of heaths.

White and Norway pine community. — When first discovered by white men great areas of the lighter soils of northern Michigan were covered by forest dominated by white and Norway pine (*Pinus strobus* and *P. resinosa*). Except for a few tiny areas in parks and rare scattered small groves this forest has all been destroyed by lumbering and fires.

Oak community. — In northern Michigan the oak forest is of minor significance. However, in the northern part of the Southern Peninsula the red, white and black oaks form a widespread successional stage.

FIRE AND CLEARING SUCCESSION

Fireweed community. — After a fire in northern Michigan the fireweed (*Epilobium angustifolium*) and other herbs quickly occupy the ground.

Bramble community. — Blackberry and red raspberry are characteristic shrubs in the thickets which develop on the heavier soils after fires.

Pine barren community. — After destructive fires on sandy pine lands there often develops a characteristic growth of sweet fern (*Myrica asplenifolia*), blueberries (Vaccinium) of several species, grass, bracken fern (*Pteris aquilina*), rose and other low shrubs and herbs. The pin cherry (*Prunus pennsylvanica*) is a characteristic shrub and other scattered shrubs and small trees occur, mostly in clumps.

Aspen and paper birch community. — The aspens (*Populus tremuloides* and *P. grandidentata*) dominate extensive burned areas on light soils in northern Michigan. Frequently associated with them is the paper birch (*Betula alba papyrifera*), which in places forms nearly pure stands. The pin cherry also is a common small tree or shrub in this community. Bracken fern may grow thickly under the aspens. In other places the undergrowth is bearberry and other forms characteristic of the undergrowth of jack-pine forest, which frequently succeeds the aspens.

Second-growth hardwood forest community. — After fires on clay soils the hardwood forest rather quickly regenerates. It passes first through a bramble or shrub-thicket stage; or, if the burning has not been very severe, the roots of the hardwood trees may send up shoots which quickly produce a new hardwood forest.

COMMUNITY OF THE AIR

Aërial community. — Many birds, insects and bats make use of the air for feeding or mating.

EROSION COMMUNITIES

Sand beach community. — Common along the lakes of northern Michigan.

Gravel beach community. — The gravel beach indicates heavier wave action than the sand beach.

Rock beach community. — Occurs particularly along the shores of Lake Superior.

Rock ravine community. — Some rock ravines occur in the Northern Peninsula, but no studies seem to have been made of them.

Mud bar community. — An important but temporary community.

Forested shore community. — Commonly occurring.

Cut-bank and bluff community. — The junipers seem not to be characteristic of this community in northern Michigan. Instead, the pin cherry, quaking aspen, willow, alder, red maple and similar trees seem to be dominant on the older bluffs.

ARTIFICIAL COMMUNITIES

Edificarian community. — Towns are fewer and smaller in northern than in southern Michigan, and farm buildings are not so common.

Orchard and park community. — Orchards also are fewer in northern Michigan.

Cultivated field community.

Pasture community.

Ruderal community.

ROCK SUCCESSION

Rock cliff community. — Rock cliffs are not very common in Michigan, but a few do occur in the mountains of the Northern Peninsula and along the shores of Lake Superior.

Rock heath community. — The first woody vegetation to gain a foothold on bare rock is dominated by the bearberry, several species of blueberries and other heaths. The creeping juniper also occurs in this situation.

Talus community. — At the base of some of the cliffs in the mountains of the Northern Peninsula there is a small accumulation of rock talus. The number of such places is so few that the community is of little importance in Michigan.

Canadian Biotic Province

The Canadian province is represented on Isle Royale, which lies in the northern part of Lake Superior, not far from the Ontario shore. This province is characterized by the abundance of conifers. However, considerable areas of hard maple forest occur on Isle Royale, and there is a possibility that this tree may represent the ultimate climatic climax. Although there are several reports on the ecology of the island, the descriptions are not sufficient to make a complete list of the ecologic communities, and therefore the communities of the Canadian province in Michigan are not listed in this paper.

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THE VERMONT VALLEY: A CHOROGRAPHICAL STUDY

STANLEY D. DODGE

INTRODUCTION

IN THE southwestern part of Vermont the northern Appalachians are characterized by three distinct elements, the Green Mountains, the Taconic Range and, between them, the Vermont Valley [1] (Pl. XIII, Fig. 1). The valley is thus shut in, for the Green Mountains rise in a continuous, almost unbroken wall. In the Taconic Range, however, there are several breaches which afford outlets to the west and which, when considered with the forbidding escarpment of the Green Mountains, help explain the fact that the Vermont Valley has been influenced to a large extent from the west, from New York as well as from the east.

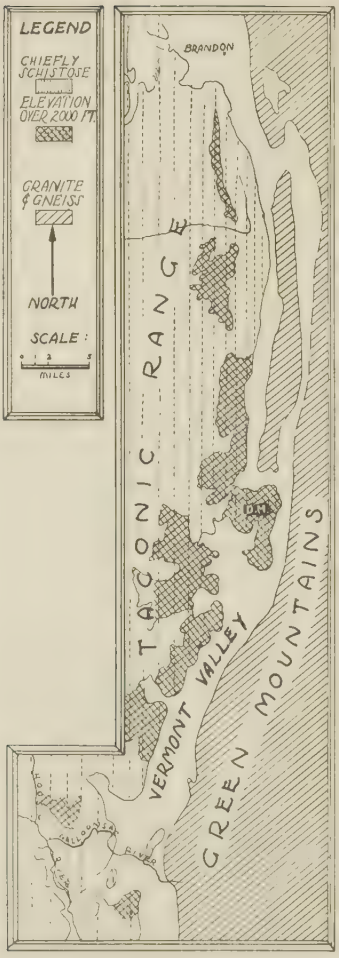
The earliest settler in the area, Samuel Robinson, first saw the valley when returning from the west to his home in Hardwick, Massachusetts. Mistaking the Walloomsac (Map 6) for the main branch of the Hoosic River which he was following, he entered the Vermont Valley near the present site of Bennington Center and, being charmed by it, decided to settle there.[2] After arrangements had been made with the Portsmouth (New Hampshire) proprietors of the area, the settlers founded Bennington.[3] That was in 1761; in 1777 the infant community was involved in the frontier phases of the American Revolution. The Battle of Bennington was fought to keep Burgoyne from capturing the town, which was a considerable rendezvous of rebels and a storehouse of military supplies.[4] It was the only settlement of conse-

[1] Dale, T. N., *Taconic Physiography, U.S. Geol. Surv.*, Bull. 272 (Washington, 1905), p. 9.

[2] Thompson, Z., *History of Vermont*, Part III (Burlington, 1842), p. 14.

[3] So named for Benning Wentworth, then governor of New Hampshire.

[4] Spargo, John, *The Bennington Battle Monument* (Rutland, Vt.), 1925, p. 53.



Map 6. General map of the Vermont Valley, showing its position between the Green Mountains and the Taconic Range. Notice the position of Dorset Mountain (D.M. on map). (After Dale)

quence near the lonely route from Lake Champlain to Albany on the Hudson. Thus, within twenty years of the settlement of Bennington, the priority of the connections with New York was established. At present the principal railroad connection is with Troy on the Hudson River. The chief social and commercial relations, other than purely local, are likewise with the Hudson River port and with the towns between it and Bennington. In addition, the southern part of the Vermont Valley shows the results of influences emanating from the Dutch along the Hudson, for the Walloomsac River derives its name from *Wallum's Choik*, signifying in Dutch, "Wallum's Patent," [5] and Batten Kill, the next stream north in the valley, obviously bears a Dutch name. From first to last influences from and connections with areas to the west have been of importance. In a sense, the Vermont Valley is detached from the rest of New England.

Broadly considered, the land surface of southwestern Vermont is simple and unvaried (Map 6). Bounded on the east by the Green Mountains and on the west by the Taconic Range, the

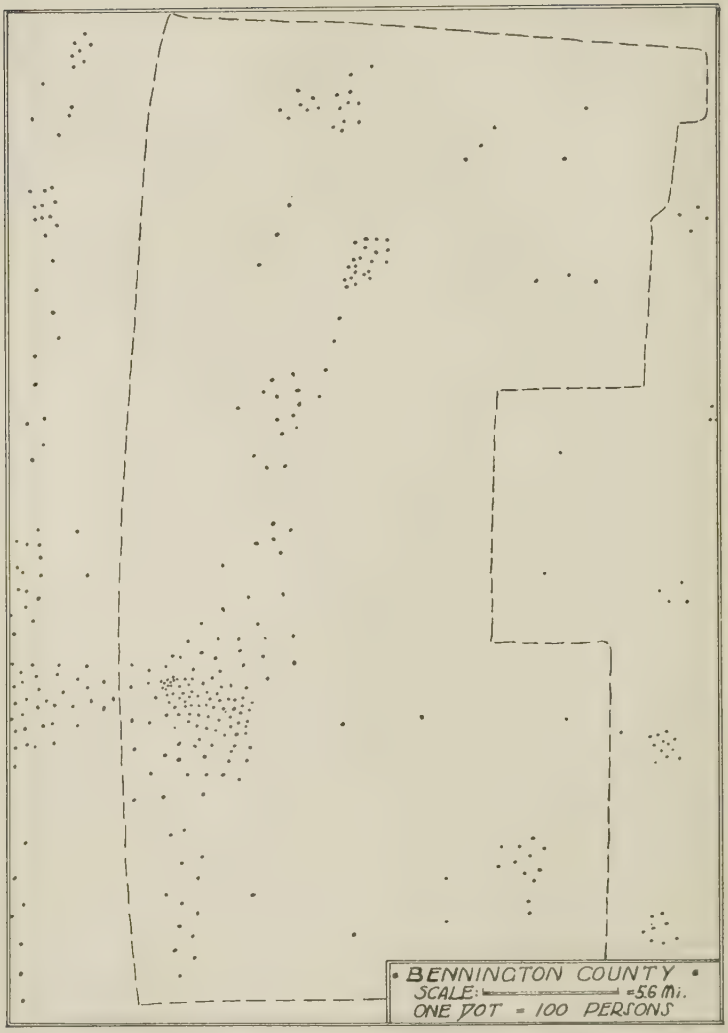
[5] Thompson, Z., *op. cit.*, p. 15.

Vermont Valley extends from near the Massachusetts border to Rutland and beyond. The southern end of the valley is separated from its Massachusetts continuation by the Dome, the western foothills of that mountain, and the deep trench of the Hoosic River. At the north it continues to Brandon, beyond Rutland, where it joins with the general area of lower land between the Green Mountains and Lake Champlain. Midway in the valley thus defined Dorset Mountain stands out boldly, reducing to a strip scarcely a mile wide the lowland connection between the two parts of the valley which it separates. From Dorset Mountain south is one unit; northward from that mountain is another unit. The area here under consideration and herein called for convenience the Vermont Valley is that part of the whole valley in Vermont that lies to the south of Dorset Mountain. It is a distinct land surface unit, a valley hemmed in on all sides by conspicuous mountains. There are openings only at the south end, where the Hoosic River cuts through the Taconic Range, and at Bennington, where a wide breach in the range allows easy and direct connection with adjacent settled areas.

The isolation of the Vermont Valley, as thus defined, is further emphasized by the distribution of population in Bennington County, which includes the area under discussion as well as parts of the adjacent highlands (Map 7). The Green Mountains and the Taconic Range are areas of sparse population. Except in the southwestern part of Bennington County, where the population of the Vermont Valley is connected by more or less continuous settlement with that of an adjacent and parallel valley in New York State, the valley as a population area stands out as a unit.

In the complex of geographic features in the Vermont Valley three elements predominate: land forms, vegetation and the phenomena of human occupance. Two kinds of land forms, preglacial and glacial, underlie the whole complex. The preglacial land forms are related to the geologic structure of the Appalachian area.[6] Superimposed on them are moraines, outwash and fluvio-glacial gravels, related for the most part to the

[6] Bowman, I., *Forest Physiography* (New York, 1914), pp. 648–649.



Map 7. Population (1920) of Bennington County, Vermont. The area with concentration of population at the south is Bennington; the area of general distribution within the county is Vermont Valley; the areas of sparse population are the adjacent highlands

continental glaciers which formerly overspread this section of North America. Vegetation varies with altitude, exposure and the hydrographic consequences of the dispositions of land forms, as well as with the distribution of elements of human culture, for in the occupance of the Vermont Valley man has altered the original vegetation. The flora of the Vermont Valley is a complex of northern and southern species. The lowlands, the valley "floor" and the lower hills of the valley itself bear deciduous trees characteristic of areas farther south. Higher hills, swampy lowlands and the high sides of the valley bear coniferous trees and other plants associated with colder, more northerly lands. These latter elements are carried southward, even beyond the latitude of the valley, by the southern continuation of the Green Mountains. The elements of human occupance which enter into the geographic complex of the Vermont Valley are local expressions of the prevailing New England manufacturing and agricultural economy. The towns are either commercial or manufacturing; the farms have, in their development, pushed back the margins of the vegetation areas, and now, in their decay, are being reconquered by that same vegetation. The area is an outpost of New England agriculture and manufacturing, a region in which industries with a nation-wide market bring a small income and in which agriculture is failing, except in relation to the towns and in a certain self-sufficient sense, because of the failure to develop commercial farming. These three categories of elements and various aspects of them are definitely related to each other, in their local distributions, in a complex system which may be referred to as the "geographic structure" of the Vermont Valley.[7]

[7] For a complete theoretical treatment of the point of view here set forth, see Sauer, Carl O., "The Morphology of Landscape," *University of California Publications in Geography* (Berkeley, California), 2 : 19–53; de Geer, Sten, "On the Definition, Method, and Classification of Geography," *Geografiska Annaler* (Stockholm), 5 : 1–37; and the references cited in each.

THE DISTRIBUTION OF VEGETATION

The fundament [8] of the Vermont Valley, the datum of human occupance, comprises land, in the wider sense, and vegetation. It is of these, primarily, that man has molded his world. Subsequent sections will discuss the part played by land and its associate phenomena, water and soil; the present will consider in its manifold relations the place of vegetation in the area.

On the basis of meager historical data [9] and of general ecological relationships, it is possible to reconstruct, tentatively, the main geographic divisions of the flora of the area.[10] Map 8 shows such a reconstruction. Six vegetation associations characterize the Vermont Valley: [11] (1) a miscellaneous mixed forest of oak, maple, birch, etc.; (2) a few more or less pure stands of beech (Fagus); (3) very nearly pure stands of pine (*Pinus Strobus*); (4) woods of Larix, commonly called tamarack or hackmatack; [12] (5) swamps with the balsam fir (*Abies balsamea*) as the dominant tree; (6) finally, wet areas which are not swamps, bearing generally a mixed flora of sedge (Carex), cat-tail (Typhia) and grass. The first three of these are upland forests and the remainder occupy low and generally wet areas.

Apparently, the greater part of the area supported hardwoods originally (Map 8), and the exceptions to this are the noteworthy features of the phytogeography of the Vermont Valley. From the north to the south of the valley runs a subordinate ridge,

[8] Since the recent use of the term "fundament" by Leighly in "The Towns of Mälardalen in Sweden," *University of California Publications in Geography*, 3 : 1, a wide variety of meanings has become attached to it. With some it seems to imply the controlling background of man's activity (fundament and occupance); by others it is used even more loosely. It is employed here in the sense that Leighly intended, a sense supported by the dictionary, that is, "ANLAGE."

[9] Thompson, Z., *op. cit.*, Part I, pp. 173–224. Cited by Burns in *Naturalists' Guide to the Americas* (Baltimore, 1926), p. 317.

[10] See Harschberger, J. W:, *Phytogeographic Survey of North America* (Leipzig, 1911), pp. 378–390.

[11] No attempt was made to give detailed analyses of the vegetation. The associations were recognized on the basis of geographical or landscape significance.

[12] Both terms were heard locally during the course of field investigations.

lower than the flanking highlands of the Green Mountains and Taconic Range, but conspicuous from the lower parts of the valley. Much of this ridge (Map 13) seems to have been covered with white pine (*Pinus Strobus*), to judge from the numerous old trees of that species that remain and from the luxuriant growth of young white pines (Pl. XIII, Fig. 2). Edaphic dryness may account for this, for in some parts of the ridge, particularly south of Bennington, tamaracks grow in places of great dryness, but not far from possible sources of seeds in swamps. Low wet areas are either open, with a Carex association, or wooded with tamarack (Pl. XIII, Fig. 3). In general, these low areas have tamarack at either end, if along a stream, and in some cases fir, and in the

MAP 8. Reconstruction of the natural vegetation of the southern part of the Vermont Valley as it was at the time of settlement

middle portions the Carex association. More general areas of lowland, i.e. wide lowlands along streams, tend to have the Carex association, with a fringe of tamarack advancing from the margin.[13]

Only vestiges and obscure indications of the original forest remain. Here and there it is possible to detect a tree which may have been a member of that forest in a part left longer untouched; here and there, as indicated above, it is possible to judge what the original forest was on the basis of what historical information there is and on the basis of ecology. The clearing of the forest proceeded rapidly at first, with the taking up of land for agriculture; now, the pace is slower, but the clearing still goes on, offset by the reconquest of cleared land by trees. These two phases of the position of vegetation in the chorography of the Vermont Valley need further attention.

I. It is impossible to indicate precisely the extent and direction of clearing at successive intervals. Clearing is still going on, and only its present status may be determined. The principal areas of clearing are on the lower slopes of the Green Mountains, where there are wood "lots," characterized by piles of cordwood [14] and by sawmills producing boards to be used in the factories of North Bennington and elsewhere. This clearing is not measurably extending the limits of the cleared area, nor, where it is going on for firewood within the area, is it resulting in appreciable retraction of the remaining areas of woodland. Indeed, for the Vermont Valley as a whole, the area in woods is increasing rather than decreasing.

II. The decline of agriculture in the Vermont Valley, an economic phenomenon probably resulting from isolation and the severity of the climate,[15] is expressed geographically by the invasion of abandoned fields by trees. Much of the agriculture of the Vermont Valley consists in the rearing of cattle for dairy purposes, of which the geographical expression is hayfields and pas-

[13] See Bailey, V., "Tamarack Swamps as Boreal Islands," *Science*, New Ser., 3 : 250.

[14] I.e. wood for fuel.

[15] Dfb, according to Koeppen, W., *Die Klimate der Erde* (Berlin, 1923), pp. 218–222.

tures. Very little land is plowed. The result is that the unplowed cleared land, left to itself, offers a fertile field for the growth of woody plants in competition with the natural grasses of the pastures and hayfields. Because of the annual cutting the latter are less subject to the invasion of ligneous vegetation than the former. Conditions suitable for the growth of woods are found in pastures especially, where grazing has injured the quality of the grass cover. (1) On the margins of hardwood areas the first comers are alder (*Alnus sp.*), sweetfern (*Myrica asplenifolia L.*) and hardhack (*Spiraea sp.*).[16] The last is as much an indication of "overgrazing" as of forest invasion, and may represent a moderately stable characteristic of that kind of land (Pl. XIII, Fig. 4). Following alder, sweetfern and hardhack comes gray birch (*Betula populifolia* Marsh [17]), sometimes called "old field birch." A cross-section of a field being invaded shows the usual succession of plants. Beyond the grass of the pasture, a zone of alder, etc., is entered, and, finally, after a hundred feet, the zone of birch, which is usually contiguous to the wooded area which is considered as advancing. (2) The invasion of softwoods, in nearly all places by white pine, is generally accomplished without woody precursors. Young white pine seems to be able to grow in bare, open fields (Pl. XIII, Fig. 2). Thus a cross-section from pasture to white pine does not show a change of species, but rather an increase in the size of the trees.

THE DISTRIBUTION OF ROADS

In the occupance of the Vermont Valley the clearing of the vegetation cover, the creation of farm land out of forest land, proceeded along definite lines (Map 9). These lines were lines of travel — roads, trails and paths. The present distribution of vegetation, therefore, bears a negative relation to the distribution of roads, and in order to understand the former in all its distributional aspects it is necessary to trace out the latter in detail.[18] The roads of the Vermont Valley may be grouped under

[16] The apt, common name of this plant suggests the difficulty experienced by New England farmers in dealing with it. [17] Probably.

[18] For general theoretical treatment of "The Road," see the book with

three heads for discussion: (1) the main arteries of travel in the valley, which are the longitudinal, north-south highway from Pownal Center to Manchester and those which at intervals of from seven to ten miles cross it at right angles, as at Bennington and Arlington; (2) secondary roads, usually of hard gravel though often in disrepair, which serve areas not lying along main ways

Map 9. A section near the southern margin of the Vermont Valley, showing typical distribution of cleared lands along highways. Explanation of symbols and numbers in legend: 1, woods; 2, pasture; 3, cultivated land; 4, hay, untilled

but which have direct access to one or another of the central towns; (3) tertiary highways connecting the secondary across intervening hills. Together all these make a net, along the strands and antecedents of which clearing and settlement proceeded.

The roads of any area may be discussed, geographically, in terms of the "fixed" points through which they pass, granted that there is a necessity for a road at all. The longitudinal road in the Vermont Valley, that from Pownal Center to Manchester, has two such fixed points through which it must pass if it is to

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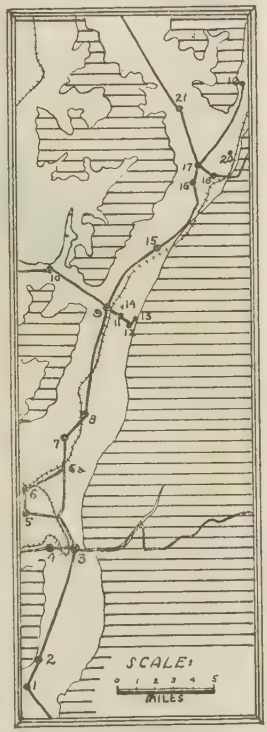
that title by Hilaire Belloc (New York, Harper and Bros.). It is an important and overlooked contribution to detailed geography.

run the whole length of the valley (Map 10). These fixed points are (1) the Gap at Pownal Center between Mason Hill, a westward extension of the Green Mountains, and a southern continuation of Carpenter Hill of the Taconic Range, and (2) either of the gaps north of Manchester, that at South Dorset between Owl Head and Bear Mountain or that at East Dorset between Green Peak and the lower slopes of Bromley Mountain. Probably the East Dorset way around Dorset Mountain, of which mass Owl Head and Green Peak are parts, is the more important, for it leads directly to Rutland, the largest center of population in the whole Vermont Valley. Between the Pownal Center gap and the East Dorset gap the main road follows as straight a course as practicable, the experience of man, Amerind and European, having revealed the shortest and least difficult route.

The easiest way from the gap at East Dorset to that at Pownal Center has been integrated with the whole structure of the Vermont Valley by the continuous remodifying effort of the inhabitants of the area.[19] Easiness of the route, owing to the complicated relief of the valley



Map 10. Main roads, villages and railroads of the Vermont Valley. Explanation of numbers: 1, Pownal; 2, Pownal Center; 3, Bennington; 4, Bennington Center; 5, Papermill Village; 6, North Bennington; 6*a*, South Shaftsbury; 7, Shaftsbury Center; 8, Shaftsbury; 9, Arlington, 10, West Arlington; 11, East Arlington; 12, Kansas; 13, East Kansas; 14, Chisleville; 15, Sunderland; 16, Manchester; 17, Manchester Center; 18, Manchester Depot; 19, East Dorset; 20, Barnumville; 21, South Dorset

[19] And by the efforts of state highway engineers in laying out improved or "state" roads.

"bottom," depends on the elimination of steep slopes either by avoidance of them or by grading and filling. From Pownal Center to Bennington the main traveled highway follows the higher ground at the base of the Taconic Range between that range of hills and the north-flowing, meadow-lined Jewett Brook. Near the highest part of Carpenter Hill Jewett Brook cuts against the base of the Taconic Range, and the main road crosses the brook twice to avoid the steep slope thus produced. At the south end of Cemetery Hill (Map 13) the highway leaves the valley of Jewett Brook and ascends the wide valley of an affluent flowing between Cemetery Hill and an abutment of Mount Anthony.[20] Immediately beyond it descends the equally wide valley of a small tributary of the Walloomsac and so reaches Bennington. From Bennington to Shaftsbury it descends the graded valley of the Walloomsac on the flood plain, coinciding here with the road to North Bennington for about a mile and a half. Then the highway turns at right angles and runs nearly straight north to Shaftsbury.

Two early settlements in the Vermont Valley were Bennington Center and Shaftsbury Center. The six and one-half mile road between them lies nearly on a meridian. It bears right once to cross the valley of a tributary of Parran Creek (Map 10) and once left to cross Parran Creek itself, at the manufacturing village of South Shaftsbury. Thence it follows north to Shaftsbury Center along the right bank of a second tributary of Parran Creek.

Before carrying the main highway northward from Shaftsbury, we should return to a point two miles south of Bennington and trace the old road from Pownal Center to Bennington Center, where it departs from that already described. It has been indicated that the present thoroughfare leaves the valley of Jewett Brook between Cemetery Hill and an abutment of Mount Anthony. At the south end of this abutment the old road to Bennington Center, still in use, rises to the higher terrace at the base of Mount Anthony, between that mountain and its eastern and

[20] The trolley, which formerly went from North Adams to Bennington, followed the gentler grade of Jewett Brook, east of Cemetery Hill, into Bennington at the east end of town.

much lower projection.[21] By the little ravine thus formed the old road ascends to the pediment of Mount Anthony and proceeds northward to the village, forming the main street. At the north end of Bennington Center, beyond the monument (Map 11), it descends abruptly to the flood plain of the Walloomsac, crosses that and joins the present main highway at right angles at the point where that road turns sharply northward, as described above. Thus the present main road between Bennington and Shaftsbury coincides with the one from Bennington to North Bennington to the point where the old road from Pownal Center to Manchester crosses it, where it joins the latter and that becomes the main road to the north. The section of the old road between Bennington Center and the northern junction with the present main highway is practically unused; it is steep, rocky, grass-grown and out of repair.

From Shaftsbury Center the highway descends in two miles to the valley of Warm Brook,[22] which it follows to a point two miles above Arlington, where it cuts through a low gap (alongside the railroad) to a tributary of Batten Kill, by which it reaches the widening of the valley of that river where Arlington is located. Thence it follows up the wide valley of Batten Kill to within a mile of Manchester, where a tributary opens a route to the main town of the north end of the Vermont Valley.

The foregoing outline of the position of the main north–south highway in the Vermont Valley indicates the importance of the complicated drainage pattern of the area (Map 13). This pattern has had a fundamental and far-reaching effect on the development of the valley, when the streams which flow across the valley are considered, for the headwaters of these streams provide the easier routes into and beyond the Green Mountains and their courses through the Taconic Range are followed by the roads westward. Thus the Walloomsac crosses the Vermont Valley

[21] Geologically this abutment is not a part of the Mount Anthony mass, but geographically it may be referred to as such, for it is not separated from it, except in detail, so far as relief is concerned. See Dale, T. N., *op. cit.*

[22] Just before the last descent to Warm Brook the new, improved road, constructed in 1930, bears left along the base of the Taconic Range to the gap above Arlington, where it joins the old road.

Map 11. Plan of Bennington, showing the relation of Bennington to Bennington Center and the spread of Bennington toward the northwest. Explanation of symbols and numbers at bottom of map: 1, factories; 2, stores; 3, an area of coarse gravel and boulders representing the unoccupied part of the alluvial fan

near its southern end and is followed by "Molly Stark's Trail," [23] the principal way to Wilmington and Brattleboro. At the junction of these two routes the town of Bennington has grown up. East of Pownal Center a little-used road crosses the Green Mountains to Stamford in the valley of the north branch of the Hoosic River, by way of a spur on the north side of the Dome and by a col between the gorge north of this spur and a branch of Broad Brook, which flows east of the Dome.[24] North of Bennington, at Arlington, Roaring Branch, an eastern tributary of Batten Kill, has opened up a gorge in the Green Mountains, which, with the gorge in the Taconic Range opposite, has made a through east–west route. This route, crossing the main north–south road, has "caused" the growth of Arlington. East of Manchester the gorge of Mill Brook, another tributary of Batten Kill, opens a way east, the second in importance in the southern Green Mountains. The gap at South Dorset provides the way west. These two, with the gap at East Dorset, account for the growth of the Manchester group of villages. Except for these four highways there are no others eastward, and there are but one or two more than the four westward through or across the Taconic Range. Each accounts for the growth of a town at its junction with the north–south road, and each is part of the major framework of roads in the Vermont Valley. This framework supports the clearings in the fundamental vegetation, the farms, the villages and, in short, all aspects of human life as expressed in the geography of the Vermont Valley. Its relation to the land surface and drainage of the valley makes those elements of primary importance in the area.

South of Bennington two roads, in addition to the main Pownal Center highway, lie in the Vermont Valley. These start at the east end of the village of Bennington, and the easternmost follows up the valley of South Brook, crossing and recrossing the stream to obtain the easiest grade. The other skirts the western

[23] So called from Molly Stark, who is supposed to have followed this route on her way to join her husband at the time of the Battle of Bennington, August 16, 1777.

[24] This road has probably contributed to the importance of Pownal Center.

edge of the wet flats above the mill pond on Jewett Brook below the confluence with South Stream. It follows along the base of Cemetery Hill, crosses Jewett Brook and ascends the steep north-facing end of the subordinate ridge mentioned above,[25] which leads southward. In the confused mass of the terminal moraine four and one-half miles south of Bennington these two roads cross, the easternmost turning west to join the main Pownal Center road, the westernmost continuing south for another half mile, where it branches widely. One branch leads east, eventually passing north of the Dome to enter the Green Mountain area. The other branch leads westward to Pownal Center. Two miles south of Bennington the easternmost road divides and one part continues southward along the base of the Green Mountains to the Dome outlet of the valley. Numerous tertiary roads bind those of the higher orders together, crossing the intervening patches of low, swampy land and ascending to or descending from the main "ridge" road.

North of Bennington there are only two secondary roads, except those that serve the wide piedmont terrace between North Bennington and West Mountain. These two routes run one from Bennington on the east side of the subordinate ridge and one from South Shaftsbury on the west side. Where there are low gaps in the ridge tertiary routes cross from one to the other of the subparallel north–south roads, as between Hale and Trumbull Mountains and south of Bucks Cobble. North of Arlington these longitudinal roads in the valley are reduced to two in the vicinity of Sunderland, where the valley makes a bend and is constricted. Northward to Manchester, however, there are three again. The same connecting of secondary roads by those of the lower order is noticeable north as well as south of Arlington.

It must not be supposed that the designation of roads as primary, secondary or tertiary refers wholly to quality, although it does in a general way. The reference is to the position of the road in the pattern of distribution in the Vermont Valley. The main highways *are* the most frequently traveled roads in the valley, besides having the principal positions in the area in terms

[25] See the section dealing with vegetation, pp. 246–249.

of structure, of integration with relief features, for they represent either the shortest north–south road from the gap at Pownal Center to that at Manchester, or one of the principal ways east or west, which themselves are "determined" by major interruptions in the relief of the inclosing mountains of the Vermont Valley. The secondary ways are inferior in quality — gravel and dirt replace concrete — when compared with the primary roads, but their secondary place is a consequence of their position parallel to the primary north–south road. They are more traveled than the tertiary roads, for most of them lead directly to "town," but they have little or no through traffic. Finally, the tertiary roads are generally ill kept, rocky and grass-grown (Pl. XIV, Fig. 1), and their position as connections between secondary highways likewise reduces them to the third rank.

ROADS AND VILLAGES

The road structure of the Vermont Valley may be considered as basic to the localization of villages (Map 10), for villages have grown up at the intersections of the main highways. The relative value of these road crossings in terms of the growth and concentration of population is shown by a comparison of the population figures (Table I) and curves (Fig. 4) for Bennington, Shaftsbury, Arlington and Manchester. The whole area was settled shortly after 1760, although a few people,[26] to whom available records make no reference, may have been there before that date.

An estimate of the population of Bennington at 1,000 in 1765 [27] is recorded on the chart (Fig. 4), but for all the towns of the Vermont Valley the first authentic count of population is that of the first census of the United States in 1791.[28]

Bennington has always been the largest town in the area.[29]

[26] Other than Indians, who are omitted from the discussion for want of evidence as to the numbers involved.

[27] Thompson, Z., *op. cit.*, Part III, p. 15.

[28] The data for Figure 4 are based on United States Census Reports, except for the years 1791–1840, for which the figures are taken from Thompson's *History of Vermont*, Part II, pp. 209–210.

[29] The data are for towns and not for villages. The first separation of the data for the villages of Bennington town from those for the town itself was in

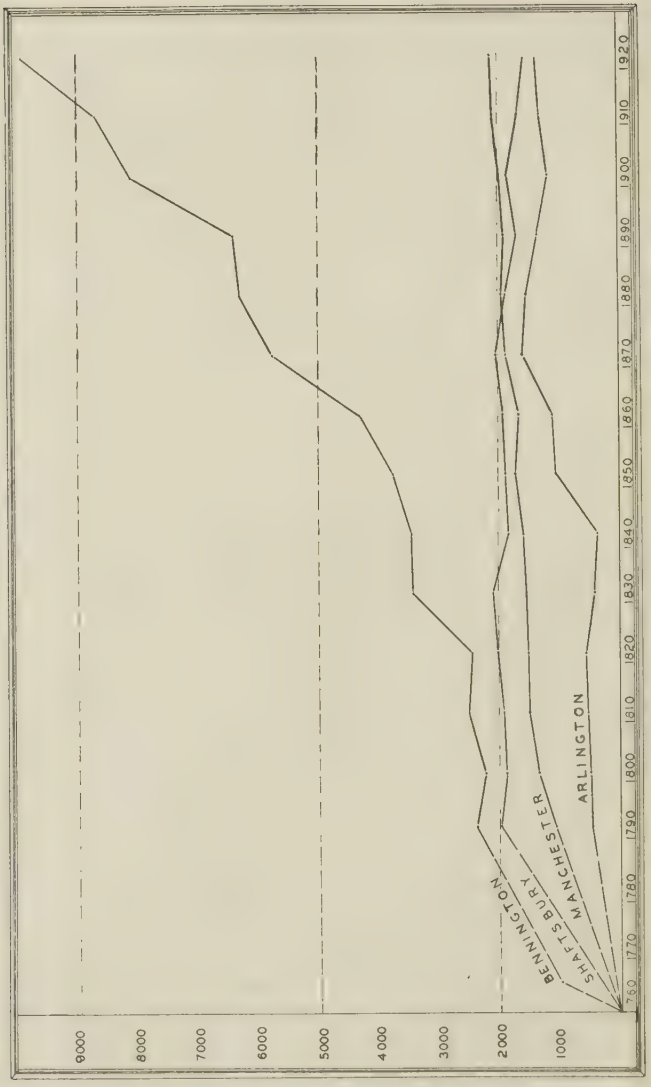


FIG. 4. Chart showing the growth of population in the towns of Bennington, Shaftsbury, Manchester and Arlington from 1760 to 1920

TABLE I

Population of Selected Towns

Date	Bennington	Arlington	Manchester	Shaftsbury
1765	1,000 *	....	....	....
1791	2,377	507	1,508	1,999
1800	2,243	459	1,397	1,895
1810	2,524	478	1,502	1,973
1820	2,485	507	1,508	2,022
1830	3,419	415	1,525	2,143
1840	3,429	378	1,590	1,835
1850	3,869	1,080	1,778	1,895
1860	4,340	1,145	1,680	1,928
1870	5,760	1,636	1,897	2,027
1880	6,333	1,532	1,928	1,887
1890	6,391	1,352	1,907	1,652
1900	8,033	1,193	1,955	1,857
1910	8,698	1,307	2,044	1,650
1920	9,982	1,370	2,057	1,534
1930	10,628	1,441	2,004	1,621

* Estimate

Apparently, its location at the main crossroad of the Vermont Valley and at the outlet of the valley has given it precedence over the other villages of the area. In addition to being the first in rank, Bennington still shows the vigor of youthful growth.[30] The possibility of industry and commerce has increased geometrically; more and more people have been able to make a living there. The population of Bennington Village totaled 7,230 in 1920. None of the other towns selected for comparison have exceeded 2,000 in number of inhabitants, except Shaftsbury in 1830, 1840 and 1870 and Manchester since 1910.[31] If Bennington is said to exhibit

1900. In that year 70.4 per cent of the total number of people were resident in Bennington Village, 2.6 per cent in Bennington Center Village, 8.3 per cent in North Bennington Village, and 18.6 per cent were rural, that is, they lived outside villages. In 1920, 72.4 per cent of the people of Bennington town lived in Bennington itself. The curves of Figure 4 are assumed, therefore, to represent the relative disparity of population in the villages considered.

[30] See Brunhes, J., *La Géographie Humaine* [3] (Paris, 1925), pp. 12–16.

[31] In 1910, 20.6 per cent of the total population of Manchester town lived

the vigor of youthful growth, Shaftsbury and Manchester must be said to have reached the stability of maturity,[32] but the growth of Shaftsbury was more or less comparable to that of Bennington till after 1820. As twin guardians of the outlet of the Vermont Valley (Map 10) they had more or less equal opportunities for growth, except for the Walloomsac Road into the Green Mountains.

Each of these centers of population, with the exception of Shaftsbury, is but a group of related villages. From Manchester on the north to Bennington on the south the settlements of each group appear scattered (Map 10); Manchester town contains the villages of Manchester, Manchester Center, Manchester Depot and Barnumville; Arlington is the focus of a group comprising East Arlington, Kansas, East Kansas and Chiselville. At Bennington one of the centers has grown so as to overshadow the rest, and the wider area involved has led to wider scattering of the village sites. Thus North Bennington, Papermill Village and Bennington Center are insignificant when compared with Bennington itself.[33]

THE GROWTH OF BENNINGTON

At the foot of Mount Anthony, where it overlooks the wide breach made in the Taconic Range by the Walloomsac River, a series of high, terrace-like formations extends westward along the river which etched them. These terraces are cut by insequent streams which isolate sections of them, and these stand out as more or less conspicuous summits when viewed from the Walloomsac alluvial fan and flood plain. It was on the easternmost of these heights that the first settlement at Bennington was made. There the gently sloping ground along the base of Mount Anthony provided land considered suitable for agriculture (Pl. XIV, Fig. 2), and the summit of the "terrace hill" provided suitable defense, although there is no evidence that it was ever fortified. Within a

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in Manchester Village. This does not include Manchester Center, Manchester Depot or Barnumville, all villages in Manchester town, for which separate figures are not recorded in the census. Consequently, the size of Bennington Village as compared with Manchester Village is greater than the township figures would suggest.

[32] Except for possible rejuvenation.

[33] See note 29.

few years a thousand people had come to live in and near "Old Bennington," as it is now called locally.[34] The chief settlement remained for some time on the summit of the hill, and stores, taverns and houses were spread along a section of the Pownal Center–Manchester road that ran along the crest.

Bennington itself, as distinct from Old Bennington (i.e. Bennington Center), has developed on the southern margin of the alluvial fan formed by the Walloomsac at its issuance from its gorge in the Green Mountain plateau (Map 14). Old Bennington was connected with the east by a road that ascended the Walloomsac. Where the Walloomsac debouches from the Green Mountains it swings to the left and flows westward near the southern edge of its alluvial fan. That it flows on the south side instead of on the north side may be regarded as accidental and subject to change except so far as the feeble efforts of man may serve to confine it to the course it now holds. There exist flood channels that lead nearly straight from the gorge outlet to the north side of the hill on which Bennington Center is located and around which the main course of the Walloomsac passes (Map 14). The road leading from Old Bennington up the Walloomsac follows the south bank of the river to near the entrance to the gorge, probably to avoid crossing the river where it is relatively wide.

The slope of the Bennington alluvial fan averages approximately 2 per cent, for there is a fall of 160 feet in the mile and a half from a point a quarter of a mile above the effective entrance to the gorge [35] to the lower edge of the fan. This grade assures water power for the string of factories along the Walloomsac. It is significant, in respect to grade, that the factories are concentrated at the upper end of the fan (Map 11), for the fan flattens out in a normal way along its down-stream margins. To the south bank of the Walloomsac, on a line with the effective entrance to the gorge, comes Jewett Brook, reinforced by South

[34] Thompson, Z., *loc. cit.*

[35] By the effective entrance to the gorge is meant that determined by the lower slopes of Bald Mountain and the lower hill on the south side of the Walloomsac. The edge of the Green Mountain Plateau on the south side of the river is one and one-quarter miles east of the escarpment (the foot of Bald Mountain) that runs north from the Walloomsac.

Stream. The waters of these two streams, below their confluence, enter the Walloomsac on a steep grade, with a fall of some 20 feet in less than a quarter of a mile. Jewett Brook has been dammed, and its waters furnish power for factories located along the right bank of the main river at the confluence of the tributary stream.

From these apparently more advantageous sites the older factory development spread slowly toward the lower limits of the alluvial fan. The newer development of factories in Bennington will be discussed below when the growth and spread of the town in relation to its situation are considered.

The main street of Bennington, the location of which, on the south bank of the Walloomsac, was described above, is crossed near the western edge of the alluvial fan by the north–south road, and here the main business center has developed. Here are the principal banks, a hotel and, adjacent to them, the principal stores.

The main outlet of the Vermont Valley is the five-mile opening in the Taconic Range between Mount Anthony and West Mountain. Northward to Rutland the Taconic Range is breached only by the narrow gorges of superimposed rivers. On the east the Vermont Valley is hemmed in by the almost continuous escarpment of the southern Green Mountain plateau. The railroad from Rutland to Troy follows the Vermont Valley southward to North Bennington (Map 10), where it turns westward. Eastward there is no railroad and there are but few other connections.

North Bennington, which thus has come to control the outlet of the Vermont Valley, has developed at the head of the rejuvenated portion of Parran Creek, where the sharp descent of that brook toward the Walloomsac allows the development of water power and where roads converge to pass down the youthful valley to the graded level of the chief river. By the larger valley an easy route is provided to Bennington, six miles southeast. The area over which North Bennington has developed is hilly, but, although its site presents difficulties for building, its situation is perhaps superior to that of Bennington.

The effect of all this on Bennington itself is manifest in the

fact that that town is growing toward North Bennington. The railroad which connects it with Chatham (Map 10) continues northward to join the main (Rutland) line at North Bennington. The section west of Bennington is little used; the portion between the main town and North Bennington is, in effect, little more than a branch of the principal railroad. Along this branch, from Bennington toward North Bennington and along the Walloomsac, to which it is parallel for part of the way, the most recent development of factories in Bennington has taken place (Map 11). These factories are better placed for the export of goods, because of location on or near the railroad, than are the older ones higher up the alluvial fan. The spread of factories is toward North Bennington, a condition of which the old factory at Papermill Village is an indication (Map 10). More important than factories, however, as indicating the trend of development in Bennington is the stream of houses that follows down the Walloomsac Valley toward North Bennington (Map 11). Both sides of the main road are now nearly completely built up with houses as far as the junction with the road to South Shaftsbury.

FARMS AND FARM SITES

The farmsteads [36] of the Vermont Valley are strung irregularly along the roads. Their distribution is thus related to that of the roads and through it to the land surface and hydrography of the area. Each farmstead consists of a group of buildings related to one another in their distribution, with regard for the greatest practical use. In general, aesthetic considerations are neglected. The houses (Pl. XIV, Fig. 3) follow the traditional New England architecture,[37] although they are somewhat smaller than the houses usually depicted in books on New England architecture.[38]

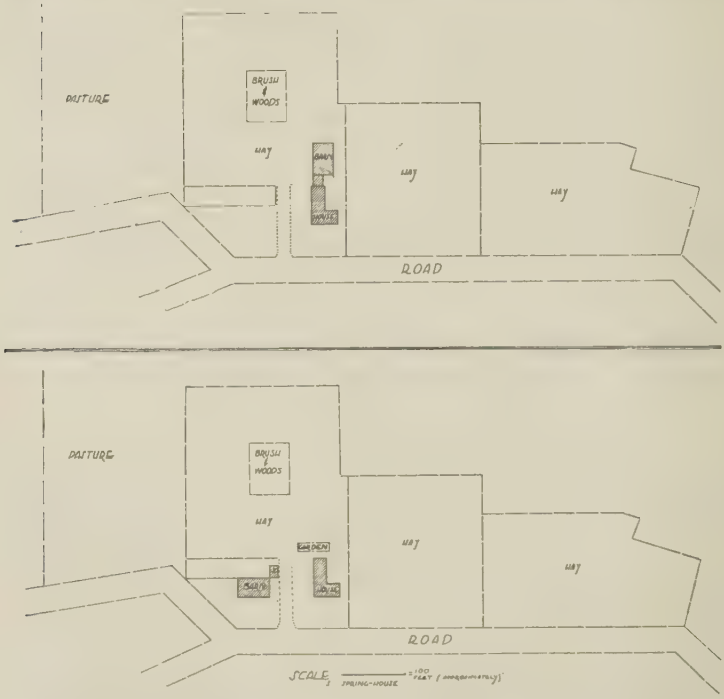
[36] The term "farmstead" is used in the sense of "home group of buildings on a farm" and not in the larger sense which includes the farm land as well.

[37] See Eberlein, H. D., *The Architecture of Colonial America* (Boston, 1925), pp. 38–56.

[38] It is a pity that an adequate study has not been made of the ordinary New England house of the eighteenth and early nineteenth centuries. Bulfinch and McIntyre have been exploited fully in numerous volumes, but the lesser "rule of thumb" house has been neglected.

They range from one and one-half to two stories and an attic. Sometimes a front porch has been added; sometimes there have been other attempts at improvement and embellishment.

The history of a single farm on the so-called back road from Bennington to Pownal, located about a mile south of the east



Map 12. Plan of farm and farmstead to show changes from early in the nineteenth century (upper plan) to the present (lower plan)

end of town, will indicate the structure of the farmstead and may stand as a type for the Vermont Valley. As originally built, the farmstead (Map 12) consisted of a single group of joining buildings. The house faced the road and was fronted by maple trees planted at the edge of the steeply sloping "front yard." The main

part of the house was oblong, with a central chimney, and the kitchen ran the length of the back of this part of the building, utilizing a fireplace in the central chimney for cooking. Behind, as an eastward extension from the north end of the house, the other elements of the economic unit were placed in order, a woodshed and a barn. The woodshed adjoined the house and the barn was connected with the woodshed by various storerooms. The attachment of the barn to the house was a convenience during the long severe winters,[39] when out-of-door work was at a standstill except for the cutting and hauling of the necessary fuel wood. The living and working parts of the establishment were thus close to one another, and the whole economy of the place functioned in a small compass.

The distribution of fields in relation to the compact economy of the farmstead illustrates further the practicality of arrangement characteristic of the farm unit in the Vermont Valley. Back of the farmstead under consideration, which is located on a terrace above South Stream, the land rises steeply two hundred feet. To the east of the farmstead, up the hill and to the south along the terrace, stretch hay lots (Map 12). North of the buildings the hillside is swampy; a stream courses down it and hummocky, wet land is characteristic. This has been left in pasture.

In the middle of the nineteenth century the danger of fire attendant upon having the house and barn joined was appreciated, and the location of the barn was changed. A new barn was built between the house and the entrance to the pasture (Map 12). The same regard for economy is noticeable. The barn is near the pasture, but the barn yard opens on the space between the barn and the "work" side of the house, since the ell of the house, with the removal of the barn, has been converted to kitchen use.

This pattern, with considerable variation in the buildings, is repeated throughout the rural (non-village) portions of the Vermont Valley. Arrangement of parts differs; the quality and aspect of the house vary, but in a very general way the type holds.

The quality of the farms in the Vermont Valley depends on position with reference to towns and on the quantity of arable

[39] See note 15.

land available (Pl. XIV, Fig. 4); probably the latter consideration is the more important, for where the roads along which the farmsteads are strung run beside a swamp, as south and north of Bennington between the subordinate ridge and the lower slopes of the Green Mountains, the quantity of usable land is small. The quality of farms varies accordingly.

Quality in farms in the Vermont Valley is noticeable in the size and upkeep of the houses. In the areas mentioned the house is small, and sometimes departs from the prevailing New England colonial type. One or two rooms and a small lean-to are all that can be counted. Unpainted and weather-stained clapboards complete the picture of impressive squalor. The quality of the farms is further noticeable in the appearance of the fields; if the forest is invading more than the margin of the fields it is a sign of agricultural decay, and the farms showing this decay must be classed as of quality inferior to those in which this phenomenon of forest encroachment is absent or less extensive in its spread.[40]

In the area of farms of low quality there are many abandoned houses (Pl. XV, Fig. 1), which usually mean that the farm is abandoned as well, although sometimes house abandonment signifies only that the land formerly worked by people living there has been taken over by others, who probably dwell on an adjacent farm.

CROPS

The ordinary field crops of the Vermont Valley are hay, oats, corn and buckwheat. Their distribution in the area follows that indicated for the farmsteads; their very presence in the valley is a function of climate and requires a statement of growing season, temperature and rainfall.

The average length of the growing season in the Vermont Valley is from 120 to 150 days.[41] Essentially mountainous con-

[40] It should be noted that the quality of many marginal and super-marginal farms is kept up by summer boarders. The scenery, the climate and the location between populous southern New England and New York City on one side and the "vacation land" of northern New England and Quebec on the other insures a good "boarder" and "tourist" business.

[41] Ward, R. DeC., *The Climates of the United States* (Boston, 1925), p. 135.

ditions favor the early descent of cold air to "pockets" in the valley in the autumn and a late "warming up" in the spring. There are few climatic data for the Vermont Valley, so that only the most general statement can be made. That statement, however, will help in explaining various crop phenomena in the area, so that it has a certain, though strictly limited, usefulness.

Figure 5 shows a climagraph for Bennington, Vermont.[42] The cool summer displayed there is a deciding factor in the choice of crops. Very little corn is grown, for the climatic requirements of maize [43] are not met. Except for sweet varieties, grown for table use, the production of corn is limited mostly to silage varieties, for the grain does not mature. But even silage corn is becoming unimportant, except in the areas of better-class farms, that is, near towns and not along streams, as the deterioration of silos suggests. As a consequence, in part of the normally cool and moist summers the farmers of the Vermont Valley have come to raise buckwheat. Another factor in the use of buckwheat in agriculture is the sourness of the soil.[44] The distribution of buckwheat is a phenomenon of high importance in the chorography of the Vermont Valley, for it emphasizes the local relief. Most of the buckwheat is grown in the higher parts of the valley, that is, on the flanking hillsides and on the upper slopes of the higher hills within the valley.

Another crop of chorographic significance in the valley is the apple. Orchards, especially one huge orchard under single management, flank the lower slopes of Mount Anthony and Carpenter Hill, rising in the notch between them and disappearing beyond the limits of the valley. This development is singular and seems

[42] Bennington is the only reporting town in the area. The figures for the climagraph are normals computed from data in the *Climatological Report of the United States Weather Bureau*, 43 (1930) : 59–60.

[43] Montgomery, *Productive Farm Crops* (Philadelphia, 1916), pp. 55–57.

[44] *Ibid.*, p. 200. During the course of field work in the Vermont Valley attempts were made to determine the distribution of relative soil acidity. Frequent sampling was tried at first, but the uniformly high acidity made it useless, with the means at hand, to determine distinctions on which a map could be based. All that can be said is "high acidity for all classes of soils."

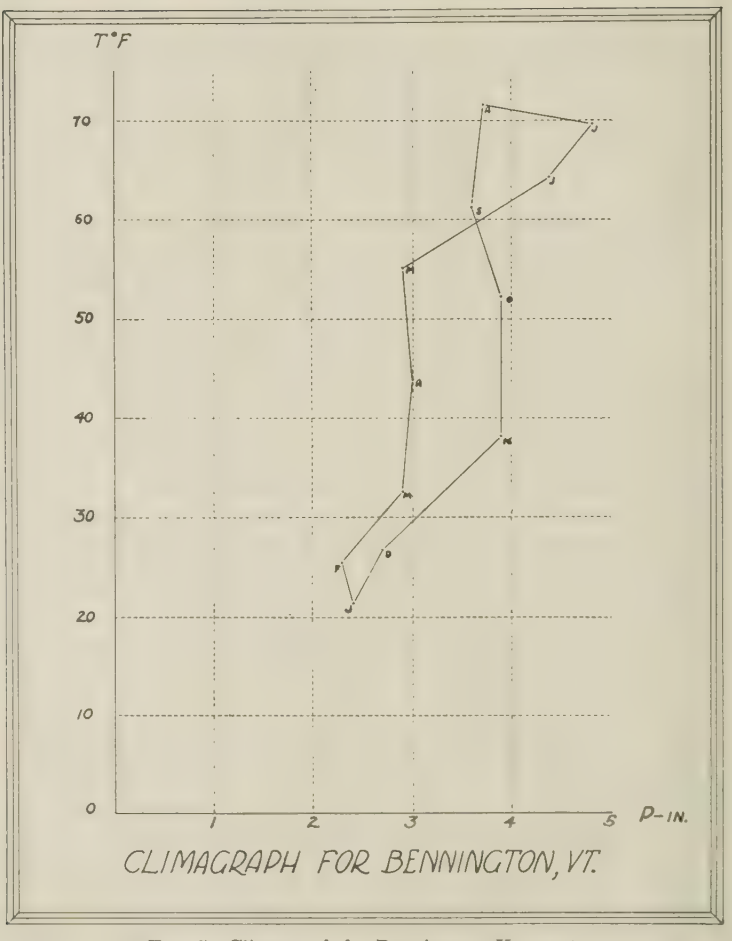


Fig. 5. Climagraph for Bennington, Vermont

to have no local economic foundation. Its economic-geographic structural relations are with Bennington Center, which has become the home of numerous wealthy families whose agricultural activities lead to display.

STRUCTURE AND LAND FORMS OF THE VERMONT VALLEY

The geographic structure of the Vermont Valley consists of the mutual distribution interrelationships of the facts of vegetation, human occupance and relief, so far as landscape significance is concerned. Other geographic phenomena are of less value in the depiction of the Vermont Valley scene. The three categories listed above and analyzed distributionally in the foregoing paragraphs comprise those elements of landscape which, taken together, most fully account for the character of the area. The vegetation of the fundament, as reconstructed, had in its distribution edaphic relationships in terms of land forms and hydrography. The present-day distribution of vegetation shows clearings along certain lines, represented by roads, which in their turn revealed on analysis certain edaphic relationships. Human occupance of the area proceeded along these "road" lines, and, although there are cultural affinities with the whole of New England and with other areas outside the Vermont Valley, the elements of human occupance are distributed within the area in relation to those landscape phenomena which appear to be basic to the whole chorography, namely, land forms and hydrography. Consequently it will be necessary to present a sketch of these elements of the physical geography of the Vermont Valley in order to understand the whole complex of the geographic structure, since upon these two elements the structure is based.[45]

Preglacial and glacial land forms the basis of the distribution phenomena of the Vermont Valley. Both have widespread connections with other parts of North America, the preglacial relief with the whole structure and history of the Appalachian system and the glacial with the development of continental glaciation in North America in Pleistocene times.

The Vermont Valley comprises three land-surface elements, the mainly granitic Green Mountains, the mainly schistose Taconic Range, folded against the Green Mountains, and the intervening "valley," the subject of this sketch, eroded by the two

[45] See Fenneman, N. M., *Physiography of Western United States* (New York, 1931), p. v.

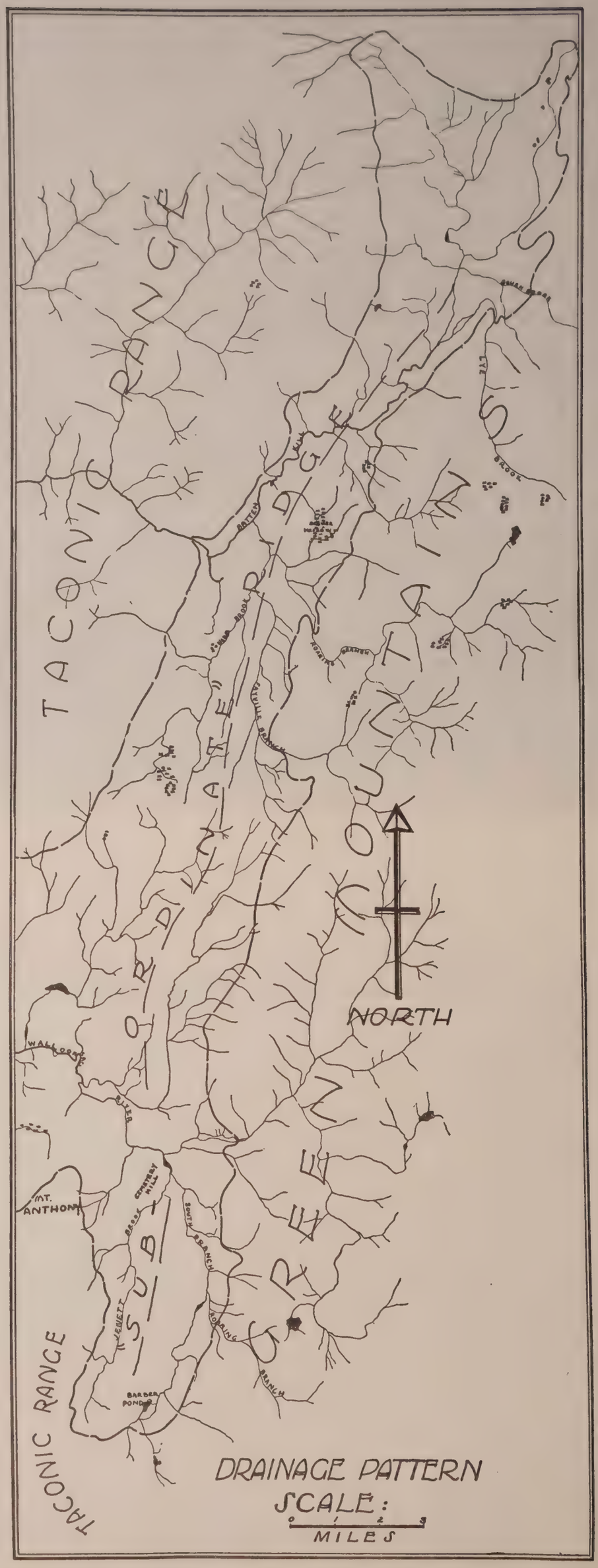
major streams of the area in the softer dolomites and marbles which underlie the schist.[46] The geologic structure is very complicated [47] (Pl. XV, Fig. 2), but so far as distribution of the land-surface elements within the area is concerned, the structure of the valley itself, with two parallel valleys and a subordinate inner ridge, is relatively simple. The stream pattern (Map 13) reveals the elements essential to the geographic structure, that is, the distribution of high and low land. It is thus to the drainage pattern that attention must be directed.

The principal axes of the drainage pattern are related to the preglacial geology. The gorge of Batten Kill through the Taconic Range at Arlington is the work of a superimposed stream, the ancestor of the present Batten Kill, but the main course of that stream is clearly subsequent to the geologic structure of the valley and is one of the chief factors in the erosion of its complicated anticline. The tributaries of Batten Kill complete the details of this erosion. So far as subsequent erosion of the anticline is concerned, Warm Brook is the southerly counterpart of Batten Kill itself. Roaring, Lye and Bourn brooks drain parts of the Green Mountains, flow across the easternmost of the valleys separated by the subordinate ridge, and enter Batten Kill after gathering in tributaries which drain the eastern, swampy, higher and glacially filled valley. The principal alignment of these tributaries is subparallel to the axis of the subordinate ridge and to Batten Kill, as the courses of Fayville Branch and Beaver Meadow Brook indicate. Near Sunderland, Batten Kill flows from the east to the west valley.

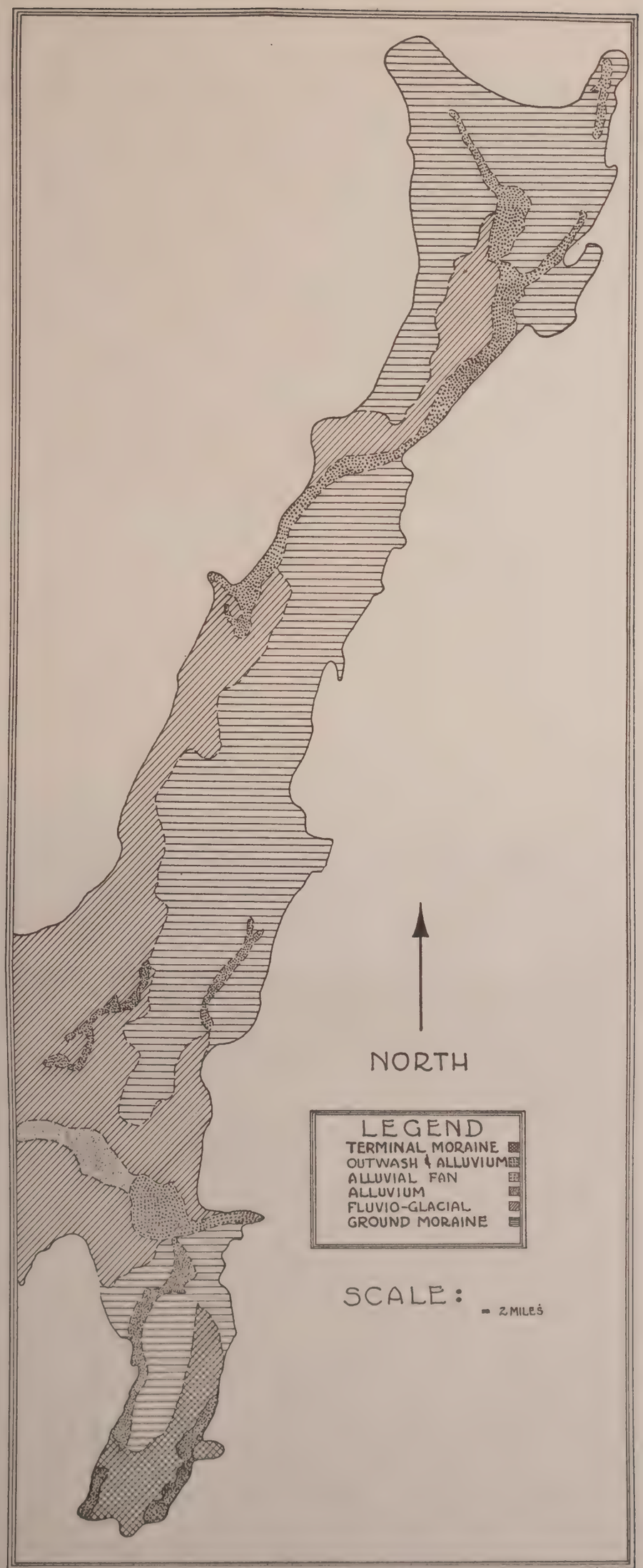
Between Arlington and Bennington, south of the watershed between the Batten Kill and Walloomsac River systems, the same subparallelism persists, with Furnace Brook and Parran Creek supplying the details. Through Bennington the Walloomsac River runs in an east-west course, superimposed on the

[46] Dale, T. N., *loc. cit.*, and *The Commercial Marbles of Western Vermont, U.S. Geol. Surv.*, Bull. 521, pp. 60–72; and Dana, J. D., "On Taconic Rocks and Stratigraphy," *Am. Journ. Sci.*, Ser. 3, 19 : 205–222, 437–443.

[47] Dale, T. N., "On the Structure of the Ridge between the Taconic and Green Mountain Ranges in Vermont," *U.S. Geol. Surv., Fourteenth Annual Report*, 1894, pp. 531–549.



MAP 13. The stream pattern of the Vermont Valley



MAP 14. Generalized distributoin of glacial phenomena in the Vermont Valley

Taconic Range, through which it and its antecedents have eroded a wide valley. In the southern part of the Vermont Valley, south of Bennington, the subparallelism is continued and emphasized by South Stream and Jewett Brook.

Although the general pattern of distribution in the Vermont Valley has as its foundation the geologically determined stream pattern, there are other aspects of that stream pattern with even more direct geographic bearing. The nature of the streams themselves and of their valleys is of the utmost importance. If an evaluation of the geographic elements were to be made, it is probable that the first rank would be assigned to the unity of lithosphere and hydrosphere.[48] The general stream pattern, already described, is basic to the geographic structure of the area; the details of the stream pattern, related of course to the general pattern, give further information concerning the geographic structure and account in detail for the varying aspect of the Vermont Valley. There is not space to present a picture of each stream and its valley. One will have to suffice.

South Stream rises in the glacially determined Barbour Pond at the south end of the Vermont Valley and flows north to join the Walloomsac at Bennington. It draws affluents from the Green Mountains and one from the subordinate ridge which bounds its valley on the west. Throughout its course it flows quietly through swamps and marshes or tumbles through natural marble pools.[49] South Stream escapes from Barbour Pond between the edge of a terminal moraine and a minor ridge at the base of the Green Mountains. This minor ridge is separated from the main Green Mountain mass in this locality by an affluent of South Stream and further emphasizes the subparallelism of watercourses in the Vermont Valley. From the outlet of Barbour Pond South Stream skirts the terminal moraine for two and one-half miles. In this section it is a quiet stream flowing through sedge and cattail marsh or winding among the encumbrances of tamaracks in a

[48] I am using the terms in the sense employed by de Geer in the article cited. See note 7.

[49] The marble pools are, of course, special cases, owing to the character of the rock that underlies the Vermont Valley. See Dale, *Taconic Physiography*, p. 9.

swamp till, at the north end, it opens in an artificial pond lying between wide-pastured slopes.

From the artificial pond to near the confluence of its major tributary from the subordinate ridge, South Stream flows in a wide youthful valley, with high terraces continuing the general level of its swampy upper course. At the north end of this section the stream again loses itself in a small swampy tract before it swings to the west around the northern extremity of the terminal moraine. At this point South Stream is joined by its subordinate ridge tributary. This stream drains the depression between the terminal moraine and that ridge, and at its north end has eroded a steep cliff in the fluvio-glacial [50] gravels which rise high above it. Thence the combined streams flow in a narrow ravine cut through schist and marble.[51] After a quarter of a mile a stretch of rapids with low pastured banks is entered (Pl. XV, Fig. 3), then another ravine with marble and schist, in which a dam has been constructed. Beyond another quarter mile South Stream opens widely into the level meadow and marsh which it shares with Jewett Brook (Map 13). At the north end of this area of flat land there is a mill pond that supplies water to the factories of Bennington. North of the pond the combined South Stream and Jewett Brook reach the Walloomsac between Cemetery Hill and a low terrace at the base of the Green Mountains.

As indicated in the preceding paragraph, glacial phenomena are intimately associated with the pattern of South Stream. The source of that stream is in a pond defined by a terminal moraine. It flows in part between the terminal moraine and the base of the Green Mountains, and its principal tributary occupies the depression between the moraine and the subordinate ridge. It has etched the high-lying fluvio-glacial gravels along the lower part of its course, and at its mouth it enters the Walloomsac on

[50] I.e. stratified.

[51] This fact suggests a synclinal structure for the Vermont Valley. However, I have let the term anticline, as found in the geological literature, stand, for in the very nature of the complicated anticline, which the Vermont Valley is admitted to be, local synclines are not an impossibility; and I have been less interested in the geologic than in the geographic structure.

the alluvial fan built by that stream in Pleistocene and recent times.

The Walloomsac (Map 13) enters the Vermont Valley from a deep gorge in the Green Mountains and flows around the north end of Mount Anthony. Its valley west of the Green Mountains is wide and graded, but built back into the ravine there is an alluvial fan which spreads out westward as far as the foot of the terrace at the base of Mount Anthony. The Walloomsac flows on the south side of this alluvial fan till it turns north along its base to go around the Mount Anthony terrace. The alluvial fan is made up of coarse gravels and boulders which merge imperceptibly with the finer alluvia of the graded part of the valley itself, north of Mount Anthony (Map 14). It is upon this fan that Bennington has been built and along the course of its river that the factories are placed.

The Vermont Valley was occupied, apparently, by a tongue of ice which filled the whole area (Map 14). For most of its distance it lay on the east side of the valley, but south of Bennington it occupied a central position. At its south end there was formed a terminal moraine which occupies the whole width of the valley, extending farther north on the east than on the west. The terminal moraine is marked by kames and flanked by outwash in which lies Barbour Pond. Outside the area covered by ice there are fluvio-glacial deposits, since eroded by the consequent tributaries of the major streams. Some details of these deposits, notably the flat-topped hill midway between Shaftsbury and Arlington, suggest that they were made in standing water. There seem to have been several areas of such local damming and lacustrine deposition,[52] as in the area cited and in the fluvio-glacial deposits north of the Walloomsac and between the gorge of that river on the east and North Bennington, South Shaftsbury and Shaftsbury Center on the west.

From north to south, from Manchester, its Dan, to Pownal Center, its Beersheba, the Vermont Valley presents a series of centers of human occupance, the people of which have also

[52] See Flint, R. F., "The Stagnation and Dissipation of the Last Ice Sheet," *Geog. Rev.*, 19 (1929) : 256–289.

etched the prevailing woods and built roads and farms (Pl. XV, Fig. 4). On analysis all these elements in the complex geography reveal certain important interrelationships which have been studied and linked, and which show that the synthesis of the chorography of the Vermont Valley, the synthesis of its important elements, land surface, vegetation and human occupance, can be understood only in terms of the first, which, combined with hydrography, is the base upon which the geographic structure is founded.

University of Michigan

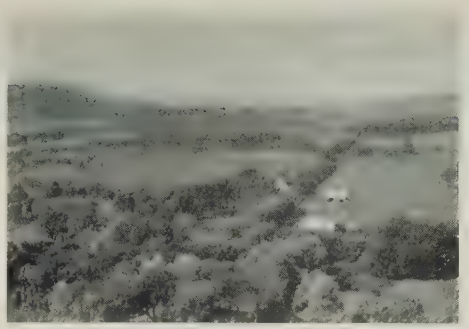


FIG. 1. General view of a part of the Vermont Valley, taken from the top of the Bennington battle monument in Bennington Center

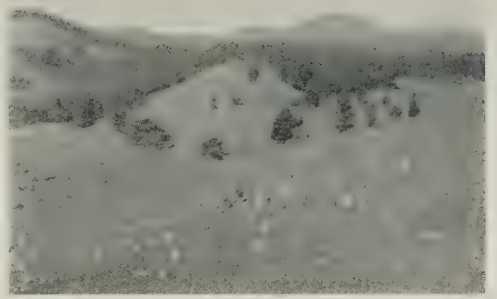


FIG. 2. Spread of young white pine along a portion of the "subordinate" ridge

FIG. 3. Portion of the "subordinate" ridge, showing tamarack in a hollow and white pine on the margins

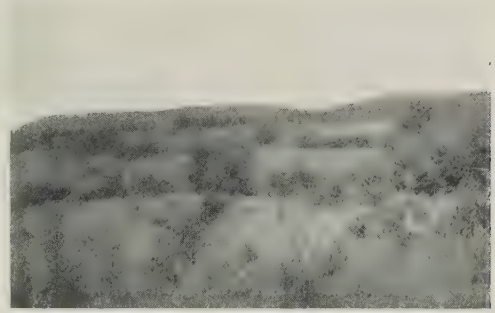


FIG. 4. Growth of hardhack and other small, woody plants in the Vermont Valley

FIG. 1. Typical third-class road

FIG. 2. Mount Anthony, a portion of the Taconic Range

FIG. 3. An abandoned house

FIG. 4. An area of "better" farms

FIG. 1. The end of an abandoned house. The farm also is largely abandoned, except for the land of better quality, which has been made use of as parts of neighboring farms

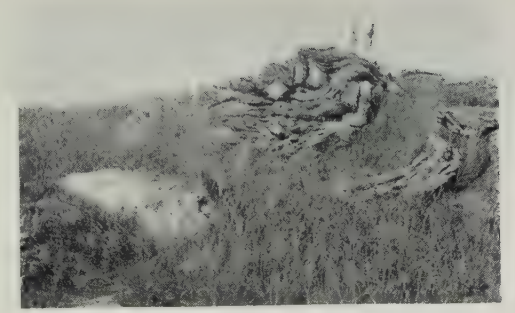


FIG. 2. The summit of Bucks Cobble, showing the complicated structure of the "subordinate" ridge

FIG. 3. A portion of South Stream, south of Bennington

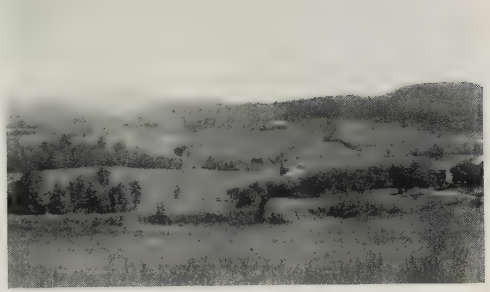


FIG. 4. A general view of the Vermont Valley

SADO ISLAND*

ROBERT BURNETT HALL

SADO ISLAND may well be called the Elba of Japan, for there lived and died the exiled Juntoku Tenno, the eighty-fourth emperor of Japan. On Sado, too, were incarcerated the beloved priest, Nichiren, and many others of less repute and nobility. Like the Korean island of Quelpart, to the south, isolation encouraged its use as a penal colony.[1]

Sado lies in the Sea of Japan about 32 miles west of Niigata City and the Echigo Plain. It is a small island with an area of only 336 square miles, but its circumference, on account of an anvil-like form, is 130 miles. The island is made up of two parallel mountain ridges lying on either side of a narrow plain which separates two deep embayments. On this plain and along the extended shore line live some 111,000 people.

GENERAL HISTORICAL BACKGROUND

Distance from the main currents of Japanese life, but still greater distance from other lands, has allowed an individual cultural development, yet one which is definitely Japanese. Sado has from remotest times been a Japanese land. It is one of the classical "eight great islands of Nippon." Unlike Quelpart, which became politically and culturally Korean, and the Tsushimas, which, though politically Japanese, have been strongly affected by Korean contacts, Sado has always been Japanese in spirit and in fact.

Each period of national history has left an impress upon the island and many ancient customs have prevailed long after they

* Social Science Research Council Fellow for research in human geography in the Japanese Empire. This monograph constitutes part of one of the four regional studies made in Japan proper in 1929.

[1] Hall, R. B., "Quelpart Island and Its People," *Geog. Rev.*, 16 : 60–61. 1926.

have passed from the mainland. The Buddhist era has bequeathed a great array of temples and the beautiful four-storied pagoda. There is an intense religious spirit in Sado, probably stimulated by the teachings of Nichiren. Shintoism, in some of its more primitive forms, is strongly intrenched and in the galaxy of its gods there are several peculiar to Sado. The dialect of Sado is almost identical with the early Kansi or court language. Here the influence of the Emperor Juntoku and the exiled Kyoto nobles is seen. The persistence in an unchanged form has parallels in other isolated areas. The feudal period left behind the ruins of ancient castles, the limitations of political divisions, and a strong spirit of sectionalism. In the dress of the common people many old Japanese customs show greater persistence on Sado than on the mainland. Examples of these are the blue denim trousers, bared breasts and blackened teeth of the women.

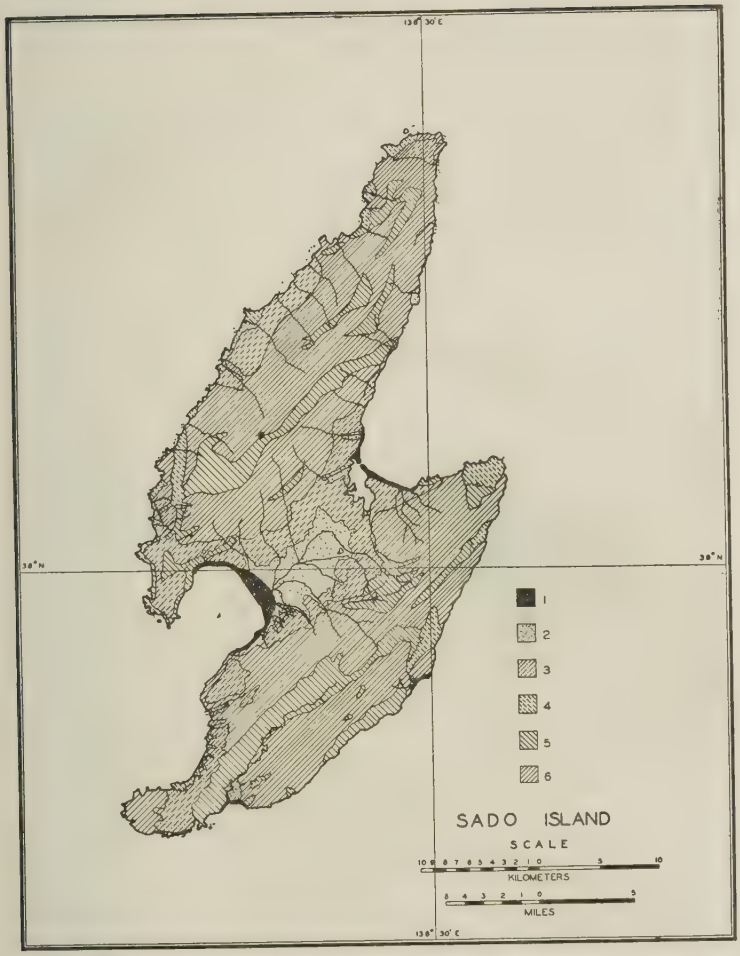
On the other hand, Sado has contributed to the total of Japanese culture. The Sado hat, the Song of Sado, the Dance of Sado, and Sado porcelain are all a part of the national culture complex.

Probably Sado is best known to the outside world for the famous gold mine of Aikawa. It is the oldest gold mine in the empire and has been worked continuously for more than three centuries. For long it dominated the life of Sado and many local festivals and customs are related to it.

A historical event of great significance was the opening of the port of Ebisu to foreign trade shortly after the Restoration.[2] This port became the "outport" for Niigata and still retains that function for some commodities. This gave Sado an early start in the modern period of westernization.

The origin of "Sado," as a geographical place-name, is moot. The Ainu word "satsu," implying a dried-up lagoon, has been frequently suggested. There are other Ainu place-names on the island. Ebisu, the chief port, is an example. Since the vast majority of sites of ancient Ainu settlements have been found on

[2] *History of the Niigata Tariff Office*, Yokohama; *Collectors' Report of Niigata and Ebisu*, Niigata, 1867; *Description of Sado*, Sado Gun Office, 1922. (In Japanese.)



Map 15. Geomorphological map of Sado Island. Explanation of symbols: 1, areas occupied by sand dunes; 2, alluvial plains; 3, diluvial terraces; 4, tertiary hills; 5, kettle-shaped tertiary hills and mountains; 6, cone-shaped hills and mountains of liparite, andesite and other minerals

the edge of present diluvial terraces overlooking the central plain of recent alluvium, the word "satsu" may have a deep significance.

"Sato," a Japanese word, meaning "narrow gate," is believed by some to contain the origins. This might well apply to the narrow central plain which separates the two mountain systems. "Zatsuta" is claimed by others, since it was once the name of the Gun division containing the island.

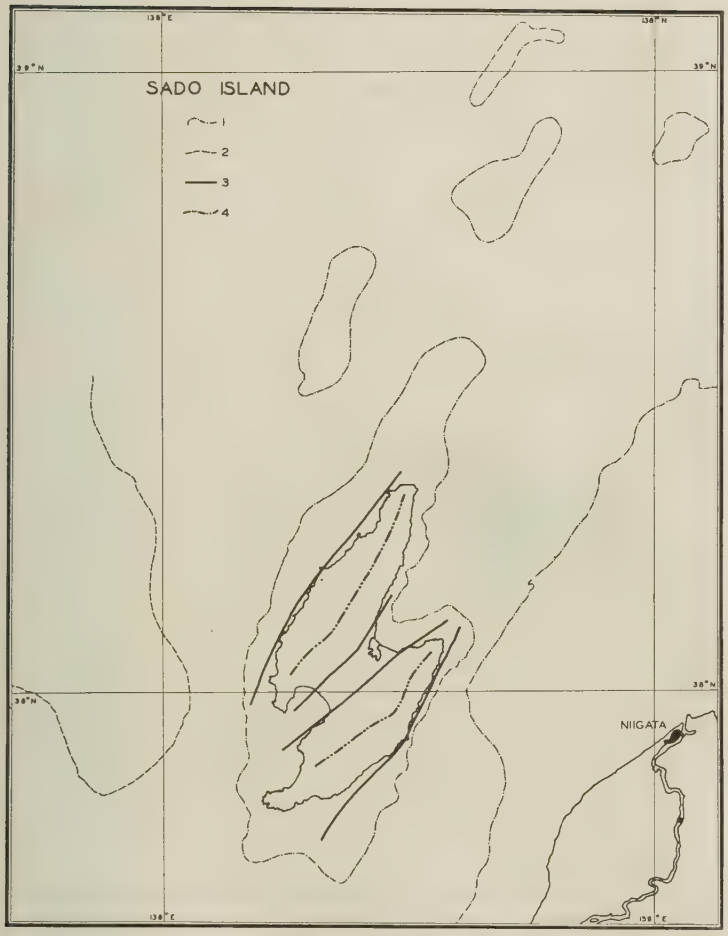
GEOMORPHOLOGY

Sado is composed of two elongated, warped domes extending, as mountain ranges, in a northeast–southwest direction. Between them is inclosed a narrow depression, the central part of which is now filled with sediments (Map 15). It is interesting to note that the trend of major surface features on Sado is parallel to that of the adjacent mainland. The tertiary rocks of the folded hill belts behind the Echigo plain have been generally identified with those of the small monoclinal island of Owa just north of Sado.[3] It will probably be found that at least the tertiary rocks of Sado can also be correlated with them.

The navigation charts add further evidence. It would seem that the passage between Sado and the mainland is a synclinal depression (Map 16). The two mountain masses of Sado, then, may be considered anticlines, with the intervening plain and bays occupying a synclinal depression. However, the work which has been done in stratigraphic geology strongly indicates that the margins of both mountain masses have been dropped down by faulting. On the north and south shores of the island there is definite morphological expression, but the scarps bordering the central plain lie below sea-level and the lines of demarcation have been deeply masked by sedimentary deposits.

The upwarping of the mountain ranges and the subsidence of the central plain are still in progress. This is revealed in a number of ways. There have been several violent earthquakes within historical times which have resulted in the uplift of new abrasion

[3] Unpublished notes and materials of Professor Tokoshige, Niigata Koto Gakko.



Map 16. Sado Island. Explanation of symbols: 1, 100-fathom depth lines; 2, 1000-fathom depth lines; 3, fault lines; 4, major crest lines

surfaces. The valleys throughout the mountain lands show several rejuvenations. In many places, a series of narrow step-terraces mark the valley sides. The alluvial fans on the mountain margins of the central plain are distinctly in a stage of youthful dissection. The rapid rate of deposition on the central plain is apparently offset by subsidence and the surface remains nearly at sea-level. Possibly the most impressive land-form development on Sado is that of marine terraces. Five levels can be recognized, which in places occur together as giant stairs leading upward from the sea. Each terrace has a distinct sea cliff at its back. Seldom is there a development of conspicuous littoral plains. Normally, the lower terrace is composed of rather fine-textured young diluvium in which the streams have cut gorgelike valleys. The second terrace is of diluvium, generally old, and is often in a stage of early mature dissection. The three upper terraces are on tertiary shales, shaley sandstones and other rocks.

In some places the diluvial terraces are not present and tertiary levels occur but slightly above sea-level. Here the streams occupy widely spaced, notched valleys. The upper tertiary terraces display a remarkable development of stepped valley sides.

The northern mountain land is the loftier and is called Ō Sado, "Great Sado." Kympokusan reaches 1,173 meters and is the culminating point of the island (Pl. XVI). Several other peaks in the vicinity exceed 950 meters, but elevation gives way rapidly in all directions. The southern system is called Ko Sado, "Little Sado," and the maximum elevation found is the crest of Daichi-yama at 646 meters. In both ranges the main divide is parallel to the coast and at approximately the center of the peninsula. Both areas are characterized by two kinds of land forms. The tertiary hills and mountains are "kettle-shaped." Their crests bear extensive surfaces of low relief of a former cycle and cause a sharp topographic unconformity with the steep slopes of the present cycle. The hills and mountains of andesite and liparite are "cone-shaped," the liparite ones conspicuously so. Neither type is characterized by flat-topped crests.

The central plain is made up of five kinds of surface forms:

(1) A central, flattish plain of alluvium lying but slightly above sea-level and rising gradually from southwest to northeast and from the center toward the margins;

(2) A terrace of younger diluvium, in a stage of very youthful dissection, which lies at one to two meters above the alluvial plain;

(3) A terrace of older diluvium, in mature dissection, rising four to six meters above the alluvial level and, together with a terrace of younger diluvium, separating the alluvial plain from the adjacent uplands and forming a broad belt which extends the width of the plain west of Lake Kamo;

(4) A youthfully dissected, intermittent fringe of alluvial fans at the infacing foot of both mountain lands; and

(5) Sand dunes extending the width of the plain on both shores.

Lake Kamo, at the northeast end of the central plain, is separated from the sea by a long sand spit. This lake originally contained fresh water, but about thirty-seven years ago the spit was cut through by wave action and the water became salt. The opening was later enlarged in the hope of using the lake as a harbor. At present, however, only very small boats can pass under the bridge which crosses the opening.

THE CLIMATE OF THE NORTH AND SOUTH SHORES

Sado falls within the Cfa climate of the Koppen system. In general, it is characterized by the same features as the adjacent west coast of Honshu, except that temperatures are somewhat more moderate. There is the same winter maximum of precipitation and heavy snows occur.

Table I shows data on comparative rainfall for Niigata and stations on Sado Island.

Exposure to the winter monsoon on the north coast and the modifying influence of the Tsushima current on the south coast are expressed in differences in land use and natural vegetation. On the south shore oranges, figs, loquats and bamboos thrive, but they do not occur on the northern coast. Mulberry trees and accompanying sericulture are much more prevalent in the south.

TABLE I*

DATA ON COMPARATIVE RAINFALL ON SADO ISLAND

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
Niigata City.....	180	131	111	105	85	131	164	122	197	171	188	234	1819
Oda (north shore).....	114	95	96	119	65	84	104	115	162	138	149	184	1425
Hamochi (south shore)	182	104	93	80	76	116	69	93	133	136	130	158	1370
Ryotu (eastern end of central plain).....	223	168	135	148	102	189	120	129	235	182	172	313	2116
Nakaoki (western end of central plain) ...	120	85	67	69	69	137	114	85	148	121	101	146	1262

Rice-planting takes place about one week later in the north. Winter dry crops on paddy land are a distinguishing feature of the rural economy of the south, but are rare in the north. The following differences were noted in the natural vegetation of the two shores:

NORTH SHORE	SOUTH SHORE
I. Few or no evergreen broad-leaved trees. No live oaks, camilla (*Thea japonica*) and *Pasania cuspidata*	Broad-leaved evergreens plentiful on lowlands, especially the live oak, camilla (*Thea japonica*) and *Pasania cuspidata*
II. Natural and abundant growth of conifers	Scanty and probably no natural growth of conifers
III. Mixed forest of pine and deciduous broad-leaved trees	No mixed forest of this type
IV. Bamboo stunted and found only in sheltered places	Bamboo luxuriant and found everywhere
V. A kind of large-leaved dogwood (called locally Kumanomizuki) found only on lowlands	This dogwood found only on highlands
VI. The great and water oaks are found, but no small oak	The small oak is found, but no great or water oaks
VII. The small Gaya is found, but the great Gaya is not	The great Gaya is found, but the small Gaya is not

* Data for Niigata and Oda are from 1911 to 1920 and for other stations from 1914 to 1920. All data in mm. Data taken from *The Rainfall of Japan, 1911–1920*, Central Meteorological Observatory, Tokio, 1927.

THE DIFFERENT LANDSCAPES

I. The alluvial plains afford the most fertile lands of the island. These are almost invariably occupied by rice paddies (Map 17). Water for irrigation is secured in several ways. The most common method is to tap streams at the foot of the mountain and to lead the water to different parts of the plain by canals. So effectively is this done that many smaller stream beds are dry before they reach the sea. On the small alluvial plains bordering the south shore bamboo pipe lines are frequently employed. Small tanks are sometimes used, but are generally located on the adjacent terrace lands. On the central plain pumps are employed and supplement the water brought by canals. The primitive Japanese pole-and-weight pump is still found, but iron hand pumps are the most common. The water table under the plain inclines from north to south, so that the wells vary from less than 10 feet to a maximum depth of 50 feet. An insect pest, which causes a premature turning of the rice crop, inflicts an average annual loss of 20 per cent of the island's rice harvest. To combat this the rice lands bristle with miniature light poles and lines. At night the fields are aglow from the myriads of electric lights which lure the insects to pans of poisoned water. Two plantings take place on the rice lands of the central plain and the south. In the spring all land is in clover or barley. Most of the clover is turned under as green fertilizer although some is fed to cattle. Rice follows and when it is well under way rows of branch peas are planted on the dikes. The central plain is the most important rice area on the island and accounts for at least half of the total acreage. The Hamochi Plain at the western end of the south shore is second in production and, owing to an abundant water supply and higher temperatures, affords the highest yield per acre. The danger of floods and the high value of paddy lands are deterrents to roads and settlements. Dwellings are usually found on the outer edge of the adjacent terrace or other higher land. Roads likewise follow the bordering elevated lands and when compelled to cross the alluvial plain do so on top of embankments.

Map 17. Sado Island, showing paddy rice fields

Near the western end of the central plain is an extensive area in which trails, ditches and fields all occur in a definite rectangular pattern. This is due to a coöperative project on the part of the landowners in which the old irregular and inefficient holdings were lumped together and the total was systematically redivided. Such regular patterns occur in widely scattered areas of Japan and may be due to a number of causes. One of the most common is the coöperative redivision. Another is the arbitrary division of lands by a large landholder among his tenants. This is commonly found on the Achigo and adjacent plains. Another cause is recent reclamation of land by either the government or a large landholder. This is common on the delta plains of Honshu bordering the Sea of Japan. An ancient form is found in the Yamato Basin and adjacent areas of the Kinki District. Here the Handen or Chinese land system was introduced centuries ago and the ancient roads, ditches and property lines still persist. In Hokkaido the recent Japanese settlement has been preceded by surveys similar to those of our range and township system and the fields are thus of rectangular design. Still another occurs on Sado, where the shoestring fishing village at the western end of the central plain has annexed the sand-dune land between it and the sea. The old trails from the village led directly to the water, so that the forms of the recently established vegetable gardens are controlled by the many parallel trails. Wherever a systematic rectangular pattern is found the vista differs greatly from the ordinary Japanese patchwork landscape.

II. The diluvial terrace lands are in dry fields or in brush or forest, except where streams in the neighboring mountains can be tapped at a higher level and water made available for rice cultivation. Rice fields are rare on the second terrace because of the coarse-textured soil material, the degree of dissection and the difficulty of securing water at so high a level (Pl. XVII, Fig. 1). The more favored first terrace is frequently in paddy. The yields, however, are low, being only two fifths of the average for the island. The first terrace contains also many dwellings, irrigation ponds, vegetable gardens and roads where there are adjacent alluvial plains.

For untold centuries man has been endeavoring to enlarge the area available for paddy fields. Where diluvial terraces border alluvial plains their bases have been persistently attacked. The result is an extension of the alluvial level and a contraction and deformation of the terrace margin. Many table-like terrace remnants, which are rectangular and which are still being reduced in size, are found far out on the present alluvial plain. Boxlike valleys extend far into the terrace land and these are slowly being lengthened and broadened. At least 10 per cent of the present alluvial level of the central plain is culturally induced.

Behind Kawaharada the first diluvial terrace contains an abundant supply of bog iron, which indicates the swampy nature of this land before uplift took place. In ancient times this iron was gathered for smelting.

III. The tertiary terraces, like the diluvial ones, are in paddy rice wherever water can be secured conveniently (Pl. XVII, Fig. 2). This often eliminates the higher terraces from such use. Little dry agriculture is practiced, since the soils are very poor. The use of tertiary terrace land for paddy is also common on the island of Shikoku. In Hokkaido even peat lands have been converted into rice fields. On the plains of the Kinki District rice has been grown year after year for centuries and little of the original fertility is left. The availability of water is a far more important factor in determining location. Fertility can be supplied artificially. In parts of Japan as much as 60 per cent of the value of the rice crop is consumed in fertilizer.

Much of the tertiary terrace surface is in brush or grass. The grazing of cattle on the higher terraces is an important industry.

IV. The tertiary hill and mountain land affords little agriculture. The narrow valley bottoms are usually in rice and the lower more gradual talus slopes offer sites for habitations and a little dry agriculture. The upper slopes are occupied by a stunted forest. Some *kwaden*, milpa or fire-field agriculture, is practiced and the making of charcoal affords an additional income to the valley dwellers. In many places there are exposed extensive areas of bed-rock which have resulted from these exploitations,

and yellow-colored scars are a characteristic feature of the tertiary mountain land. In the north there are some small stands of pine and in the south bamboo is frequently found.

V. The andesite and liparite mountains are forest-covered. Only a few of the wider valley bottoms contain rice fields. A little *kwaden* is practiced, but is far less common than in the tertiary mountain country. The preparing of charcoal is of some importance, but lumbering is the first industry and furnishes an important export to the mainland. The gold mines of the island are all associated with these mountains.

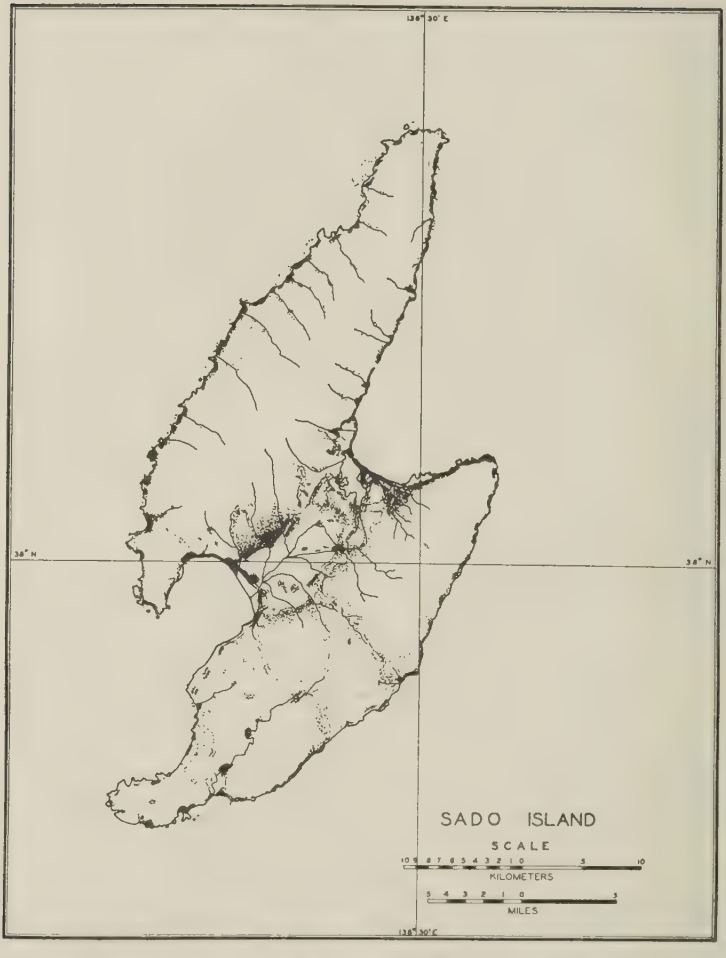
VI. The sand dunes are important locations for villages and roads, since they occur near the sea and afford dry sites above the alluvial plains. Vegetable gardening has been recently introduced and has been developed in the dune lands to such a degree that it not only supplies the market on Sado, but furnishes a large export of fresh vegetables to Niigata City and other mainland markets. Pine forests occupy considerable areas of this sand land and some timber is cut.

VII. The alluvial fans are chiefly waste lands, although some paddy and dry fields are found. Fans at the edge of the sea are often the sites of fishing villages.

SETTLEMENT

Half of the island's population is on the central plain. Settlement here is largely confined to the inner edge of the lower diluvium terraces (Map 18). A few compact agglomerations (*Haufendorf*) are found where important roads meet and there is a marked development of shoestring villages (*Strassendorf*) along the main highways. In general, however, the settlement pattern of this area may be described as one of dissemination approaching agglomeration. Dry garden lands separate house from house, and valley paddies and small areas of pine forests separate clusters of houses from each other.

As in the adjacent mainland about Niigata, there is a remarkable development of *Strassendörfer*. These occur as fishing villages on the narrow strips of land between sea cliff and sea or on low narrow terraces. They are also found along the highways



Map 18. Population map of Sado Island. Each dot represents six persons

which follow the crests of sand dunes and on the lower slopes of narrow valleys where the bottom land is in paddy. A number exceed a mile in length and on the shore of Futami Bay a virtually unbroken double row of houses marks the road for seven miles. The larger agglomerations of Sado are all port towns. Without exception these are outgrowths of simple *Strassendörfer* and are still elongated in form although they may have developed other streets parallel to the through road.

The buildings of Sado are chiefly of the Echigo type.[4] They are of heavy boards, with thick wooden shingle roofs which are weighted down by stones. Long eaves extend over the walk in front of the house to protect passers-by from sliding snow in winter. The ground plan shows a long narrow house with the ridgepole at right angles to the street when the house is one of an agglomeration or parallel when it is a lone rural dwelling (Pl. XVIII). The kitchen lies at the rear of the house and is reached by a narrow dirt-floor passage from the street. The houses of the fisher folk of the south shore have a sickle blade mounted above the crest. The blade points southward and is believed to discourage the evil spirit of the typhoon. On the central plain there are occasional dwellings built on the Kinki plan. These tell of the past influence of political exiles from Kyoto. The several buildings are arranged about a drying yard and are connected by walls. Entrance is made through a high gate. The "shoji" and lighter structure of the houses differentiate them from other habitations.

Temples and shrines form an important part of the cultural landscape. The central plain has several fine temples, a great four-storied pagoda and many shrines. Shrines to the Sado god of fishermen, Zimpozi, are countless. On every headland, atop every coastal islet and at every other point which can be seen far at sea, miniature shrines like the temples of the ancient Mediterranean shores guide and protect the mariners. At many points primitive white or unpainted torii of natural logs mark the path from the shore to some hidden shrine. In numerous places a

[4] Hall, R. B., "Some Rural Settlement Forms in Japan," *Geog. Rev.*, 21 : 110–117.

torii rises from the sea, some distance offshore, like the more famous torii of Miyajima.

POPULATION AND LAND

The total population residing in Sado has not changed appreciably for some years. The natural increase, which averages something over 1,200 per year, is about comparable to the trends for Japan proper as a whole. This natural increase in Sado is offset by migration. In 1928 there was a registered population of 132,379, but only 110,974 actually resided on the island,[5] that is, 16 per cent of the total registered population had found new homes in Hokkaido, in the industrial cities of Japan and in Brazil. It is interesting to note that the more isolated sections of Sado have contributed very little to this migration. Takaishi Mura on the north shore has but 0.7 per cent of its population residing outside. Uchikaifu and Iwakubi Muras, also on the north shore, have 2.3 and 5 per cent, respectively. This is reflected in large families. The former averages 6.9 persons to the family and the latter 6.5. In Aikawa and Nishimikawa, both mining areas, the migration has been heavy. Aikawa has a registered population of 13,370, with but 7,184 residing in the town. The loss has been 46 per cent. The average family shows but 4.0 persons residing at home. Nishimikawa has lost 42.6 per cent of its population. Ogi, a port and fishing settlement, now has an excess of 125 people over the registered population (Pl. XIX, Fig. 1). This is due to stimulated economic activity resulting from recent harbor improvements and industrial development. In general, the more accessible sections have lost the greater part of their people, whereas the more isolated populations have little opportunity to get out; apparently, under the present economic system, Sado has reached a point of population saturation.

The total area of arable land in Sado is about 140,000 *cho*, of of which approximately three quarters is wet rice land. The distribution of ownership, unlike that of the adjacent areas in Honshu, is remarkably uniform. Only 21 individuals own in excess of ten *cho*, 103 own more than five *cho*, 4,016 own between three

[5] Statistical data supplied by the Sado Subprefectural Office.

and five *tan*, 8,214 own farms of less than five *tan*.[6] The distribution of other forms of wealth is similarly uniform and results in a homogeneous cultural landscape.

ROADS AND CARRIERS

As on typical small islands, a shore road entirely encircles the island. In places this road is improved and is now used by motor busses (Map 19). In other places, it is but a trail. Between Togi and Tochu, on the north shore, a 250-foot cliff rises above the sea (Pl. XIX, Fig. 2). Here the shore road, which for some distance has been following the shingle beach, comes to an end at high tide. At low tide one must run along the wet sand at the base of the cliff on the receding wave. Beyond this point the north coast is the most isolated and backward part of the island. Rickets, bad eyes and physical and mental deformities are the scourge of the population. Poverty and unsanitary conditions are rife. A saddle-like pass cuts the northwestern peninsula and is followed by a road which connects Aikawa and vicinity with the central plain. No other roads cross the mountains of Ō Sado. The lower southern mountains, however, are crossed at three points by good roads.

Cattle are the chief carriers on Sado. There are few horses and few wheeled vehicles. Human packing is more common than in most parts of the mainland. Motor busses now ply between the central plain and the coastal points which are accessible, but are employed almost exclusively for passenger traffic.

AIKAWA

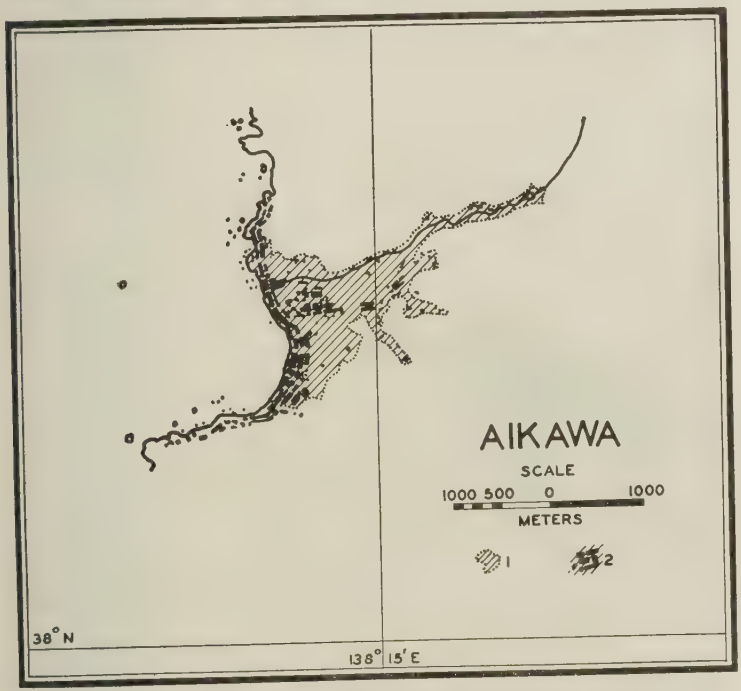
The gold mines of Aikawa have brought Sado its greatest fame. The production of gold is an ancient industry of the island. The first mine discovered was the Sawanetsuruko, to the east of Aikawa, in 1542. The washing of gold sands, however, far antedated this discovery. The first mine of Aikawa was discovered in 1601 and the present mine was started in 1606. Fable has it that a lone fisherman one night saw the reflection of the

[6] One *cho* = 2.45 acres; one *tan* = 0.245 acre.

Map 19. Political, road and location map of Sado Island. Explanation of symbols: 1, mura boundaries; 2, important roads; 3, secondary roads and trails

moon on a nugget of gold and the discovery followed. After the opening of the present mine Aikawa enjoyed great prosperity.

The mine became the property of the Tokugawa Shoguns and provided an important income for them. Three hundred shafts were sunk and production increased rapidly; miners,



Map 20. Map of Aikawa, showing the ancient extent of the city and the present occupied area. Explanation of symbols: 1, Aikawa at the time of its greatest extent; 2, area occupied at present

artisans and the many classes of people who served the workers poured in from the mainland. By 1613 some 120,000 persons had settled in the town of Aikawa, which extended far up the valley behind the present town and even spread out over the lower terrace lands adjacent (Map 20). The peak of production

was reached in 1626, after which a gradual decline took place. More effective methods of mining, coupled with a decreasing production, reduced the number of people employed and the city of Aikawa slowly shrank to its present population of 7,184. There is a continuous cartographic record of this decline from 1694 to the present time. Remains of the ancient town may be seen on every hand. The site of ancient Ginzan Machi ("Silver Mountain Town") is readily identified. Aikawa included this town and extended from it to the sea. Temples and shrines mark the different peripheries. Compact groups of dwellings are scattered here and there over the area once occupied and are remnants of the former city. The remains of stone walls which once protected the ore warehouses may still be located.

Map 20 has been constructed from this field evidence and from the ancient maps.[7] The maps of 1694 and 1695 show the valley to be built up solidly from the sea to Ginzan Machi, but indicate along the sea an area of occupied land narrower than that at present used for habitation.

An increased interest in the sea has accompanied the decreasing dependence upon mining. The map of 1890 shows marked widening of the occupied area along the shore, but not to the limits of the present town. According to this map there were several more remnants of the old city than are found today. A village of possibly one hundred houses is represented on the site of Ginzan Machi. The map of 1911 indicates only a dozen or so houses on that site. It also reveals a decrease in the number and size of remnants, but a continued extension of occupied land along the shore. At present, no buildings mark the site of Ginzan Machi and the shore village forms a long serpentine settlement at right angles to the major extent of the old city.

After the Restoration the mining property passed into the hands of the Meiji emperor and was turned over to the Bureau of the Interior. The opening of Japan to foreign trade brought great distress to Aikawa, since gold could be imported more cheaply than it could be produced by primitive methods. Relief was temporarily tendered by the national government and new

[7] Collection of maps of the Sado Mine office, Aikawa.

methods of mining were introduced. In commemoration of the kindness of the Meiji emperor in that time of distress a great festival is now held annually at Aikawa. In 1896 the mine was sold to the Mitsibushi family, by whom it is still operated. For 328 years, then, there has been a continuous production of gold at Aikawa. No other gold mine in Japan can claim such a record. Eight other mines in the empire now exceed the production of Aikawa, but it is doubtful whether any can equal it in the total volume of its production. It was estimated in 1929 that there had been an average monthly production of 40,000 grams for 50 years and an average monthly production of 10,000 grams for 276 years. This would have brought the total production of gold to 57,120,000 grams by 1929. It is claimed that in the ancient days the best ores ran as high as 5,000 grams per metric ton, but now the best do not exceed 500 grams and the average seems to be about 5 grams.

At present there are two main shafts, each of which is about 1,000 feet deep. Modern machinery is employed, although the condition of the 400 men and women miners reminds one of Dickens's description of the English coal mines. An average of 10,000 metric tons of ore is now taken out each month. It is believed that at the present increasing rate of production complete exploitation will have taken place in from 10 to 15 years. Silver and copper occur with the gold. Silver now exceeds the gold fifteen times in volume; about 700 kilograms of copper are produced each month. A hydrous iron clay occurs with the ores and forms the basis of the Aikawa porcelain industry. The refining of gold and silver is done at the mine, although some of the higher grade amalgamations are shipped to Osaka. The better copper goes to Naoshima in Okayama Prefecture, but the very low grades are processed locally.

INDUSTRY AND EXPORT TRADE

The most valuable production of Sado, like that of Japan proper, is rice. The average annual production is about 170,000 *koku*,[8] of which approximately 50,000 is exported. The chief

[8] One *koku* = 5.11 bushels.

dry-land crop is barley, which is almost exclusively a sustenance crop. Vegetables are grown on the dune lands for export to Niigata. Very few mulberry trees are grown and only six hundred families are engaged in sericulture. The rearing of cattle is of considerable importance and Sado is famous for its beef in the markets of western Honshu. The forests produce lumber and charcoal for export. In these activities 65,000 *cho* of land are employed.

Next to the combined productions of the land, fishing produces the most wealth. A variety of fishes and large quantities of seaweed are exported to the mainland.

Owing to its offshore reefs, Tasha is famous for *tai* or sea bream, the favorite fish of all Japanese. Kita-Ebisu is the chief center for edible seaweeds. The south shore is noted for its cuttlefish and ear shells. Strings of these fish may be seen drying on the front of every fisherman's house; they are an important article of export. Octopus is a noted product of Sado Island. The sea floor off the north shore is rocky, and fishing is largely by line and spear. Many kinds of fishes are secured for local consumption and export. Sado fish dealers are seen in all the markets of Niigata Prefecture.

There are few manufacturing industries of importance in Sado. Bamboo articles, chiefly baskets and vases, are produced by home industry all along the south shore. A few coppersmiths are still to be found in Aikawa, but their work is poor. Sado porcelain is made in Aikawa, though there is little export.

There are five small hydro-electric plants, and few villages are so isolated that they do not have electric lights.

The preparation of *miso*, a base for soup, is the most significant manufacturing industry. At Hamochi two factories each employ about two hundred workers and have an annual production of 70,000 to 80,000 *kwan*[9] barrels. The industry is located on Sado chiefly because of cheap labor. Seventy-five *sen* per day seems to be the average wage for all classes of workers. The raw materials are all imported. The beans come from Chosen, the rice comes from the northern part of the Echigo Plain, and the salt

[9] One *kwan* = 8.26 lbs. (avoir.).

PLATE XVI

Kmipokusan and the Ō Sado range from Kanazawa on the central plain. Note the abrupt lower slopes facing the plain.
Picture taken April 10, 1930

FIG. 1. Rice on the lower diluvial terrace north of Kita-Ebisu. The upper terrace also is of diluvium, but is chiefly in brush

FIG. 2. A tertiary terrace in paddy fields on the far northern coast. Note the youthful valley in the foreground

PLATE XVIII

An isolated rural habitation of a type common on Sado Island and the Echigo Plain of Honshu.
Many drying racks are in front of the house and on the dikes

FIG. 1. Fisher folk in the harbor of Ogi

FIG. 2. A typical fishing village of the north shore. Along the beach are many small boats and the piles of drying seaweed. Cleared patches of terrace land can be seen in the background

from Bingo on the Inland Sea. Exports go chiefly to Tokyo, Saghalin and Hokkaido. There are two other smaller *miso* factories on the island, one at Ōishi and one at Mano. There are also five or six small *shoya* (i.e. soy) factories, of which two are at Hamochi.

CONCLUSIONS

Sado is much like other small islands of similar location in that its culture, although a part of the general mainland complex, bears a definite local stamp. Throughout the island there is a marked uniformity in language, customs and material culture. This, together with a uniform distribution of wealth, has led to homogeneity in houses, vehicles, fields and in fact in all forms of the cultural landscape.

It is apparent from population trends and the general standard of living that Sado has reached a saturation point in regard to population. Unless some unexpected cultural rejuvenation takes place Sado will continue to be an area of migration and relatively low living standard.

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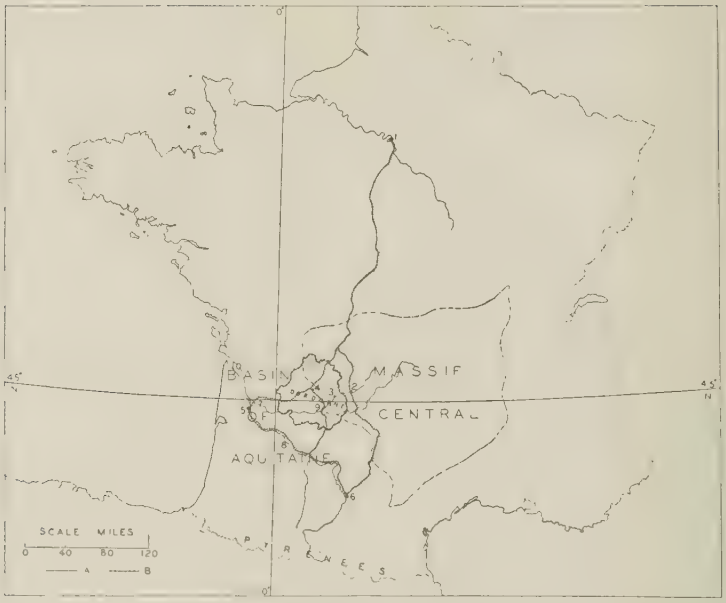
THE OCCUPANCE OF THE LOWER VÉZÈRE VALLEY

HENRY MADISON KENDALL

CONSIDERATION of the ways in which man has lived in an area and of the imprint of the past on the present landscape is very frequently limited by the fact that such an area has been used as the home of man for only a very short time. Changes which have come about relatively recently are usually noticeable. The major changes which have taken place in an area during the whole of what may be considered as the historic period are in evidence. It is in only a small number of areas, however, that prehistoric study has made possible a comparison of some of the major landscape elements in terms of occupance at widely separated periods. The area in France spoken of in common parlance as Périgord is such an area. The valleys of the several streams which have cut their way across this area are the centers of past human occupance as well as of that of the present. The Vézère Valley is one of those in which a considerable number of the facts of past occupance are laid bare and in which present occupance can be readily examined. It may be taken as illustrative of the region in general, and, on that basis, a part of the sequent occupance of the whole area may be set forth.

Périgord is the "pays" name of all except the southwestern portion of the Department of Dordogne (Map 21), which lies in the northeastern section of the Aquitaine Basin.[1] This basin is the southernmost of the two large lowlands of France. It is closed in on the northeast by the Massif Central and on the south by the Pyrenean mountain system. During secondary and tertiary times a quiet sea occupied the area and limestone deposits

[1] For a general discussion of the Aquitaine Basin, see Févre, J., and Hauser, H., *Régions et Pays de France* (Paris, 1909), Chap. XIII.



Map 21. France, showing Department of Dordogne and its relation to physiographic divisions, river systems and rail routes. Explanations of letters and numbers: A, railroad; B, boundary of Department of Dordogne; 1, Paris; 2, Brive; 3, Montignac; 4, Périgueux; 5, Bordeaux; 6, Toulouse; 7, Dordogne River; 8, Garonne River; 9, Vézère River; 10, Gironde estuary

were formed.[2] An uplift during tertiary times in the section adjacent to the Massif Central gave rise to a series of relatively high plateaus. Between these plateaus and the Pyrenees deposition continued. This and the gradual retreat of the sea resulted in the formation of plains. Later deposition gave rise to a plateau fringe along the Pyrenean front, and during the period immediately following this the present drainage pattern became established. The Garonne River occupies the lowest portion of the

[2] Gallouédec, L., and Maurette, F., *Géographie de la France* (Paris, 1929), 235.

basin and flows in a northwesterly course, with many tributaries from the high land masses on either side. The Dordogne joins the Garonne in the Gironde estuary.

The Vézère River is one of the major right-bank tributaries of the Dordogne in its course from the Massif Central westward through the basin. The Vézère rises in the more rugged portion of Limousin and follows a southwesterly course through the western part of the Massif and through the fringing limestone plateau to its confluence with the larger stream.

Near its junction with the Dordogne the Vézère is about two hundred feet in width and occupies a winding course over the wide floor of its intrenched valley (Pl. XX, Fig. 1). The upland in which the valley is cut has a general level some two hundred feet above the flood plain. Scroll-shaped flats occupy alternate sides of the valley floor and show some evidence of a second uplift of the area. The course of the river is blocked in places by rapids and the present stream has cut regularly below the level of the flats. Steep sides of cliffs alternate with gentle slopes along the course of the meandering valley. Tributary streams are conspicuously few in this section of the course of the Vézère. As a result, there are few noticeable breaks in the wall-like character of the valley sides (Pl. XXI).

The soil covering varies in accordance with the surface features. On the upland it is of a reddish color, thin and rather stony, with irregular fragments of partly decomposed limestone occurring throughout. On the gentler slopes of the valley this same general type is found. Irregularly scattered patches of sandy-textured soils occur both on the upland and on the gentler slopes. Many of the cliffs have been at least partly obscured by the accumulation of rock débris and its consequent weathering, and there has been some deposition by water on these slopes. The valley bottom is covered with alluvium of a darker color and a finer texture than the other soils. It is gravelly in the parts farthest from the stream. The covering of the steep slopes is of no use for crop production. That on the gentler slopes and on the upland has been and is being used where it occurs near population agglomerations. The valley floor, however, appears best

suited for cultivation, and it is on the alluvium that most cultivated land now appears.

Mixed forest on the upland and on the slopes and grass in the valleys typify the region as regards natural vegetation. A considerable portion of the forest cover still exists, though much of it is second growth and some of it is the result of planting (Map 23). The most common trees of this forest are chestnut, oak and birch. In the valley bottoms there are many poplars and occasionally willows border the river. Some of the upland appears to be too dry for forest covering and in places it greatly resembles the heath land of Scotland.

The dryness of the uplands is emphasized by the absence of surface water. The character of the country rock, rather than the lack of sufficient precipitation, brings about this dry appearance. The whole area lies open to the west and it is sufficiently near the coast to show in a small degree the marine climatic influence.[3] The yearly precipitation is about thirty-five inches.[4] Ground water is plentiful and along the cliffed valley sides springs are quite common. The valley flats are rarely too dry to support vegetation, even during prolonged drought. During the spring these valley flats are partly flooded when the melting snows of the Massif Central increase the volume of the Vézère.

In this setting human beings have lived for many thousands of years. They have occupied this area in different ways and they have used different parts of it for their settlements. By a consideration of the sites occupied and the ways in which the inhabitants have lived and are living, a small part of the story of sequent occupance may be set forth.

The discovery of prehistoric artifacts has led to a knowledge of the kinds of places occupied by ancient man and of the kind of life he lived. Implements of all the divisions of the paleolithic period and of the neolithic period have been found in the vicinity

[3] The climatic type in the symbols of the Köppen system is Cfb.

[4] See rainfall map of France in Bernhard, H., *Landbauzonen, ländliche Entvolkerung und landwirtschaftliche Einwanderung in Frankreich, mit besonderer Berücksichtigung der schweizerischen Ansiedlung in Südwestfrankreich* (Bern, 1927). See also other maps in this work.

of Les Eyzies.[5] Those of the paleolithic period are more numerous and have been examined in great detail. Two of the type stations of subperiods of the paleolithic, the Mousterian and the Magdalenian, are located in the valley.

Two kinds of sites were occupied by man in paleolithic times. He lived in rock shelters on the cliff faces and in solution caves in the limestone. The caves always open on the steep valley side. None have ever been discovered on the more gentle slopes. The rock shelters exist all along the river wherever cliffs are found. They are simple indentations in the face of the cliff. In many places they have been completely obscured by the accumulation of rock débris since the time during which they were occupied.

They usually occur well up on the valley side, although elevation depends to a certain degree upon the position of the less resistant portions of the limestone of which the plateau is made. For about one hundred to one hundred and twenty-five feet above the level of the river there is a rather sharp slope covered with a growth of scrubby trees and brush. Above this there is an expanse of bare rock surface rising nearly vertically for from thirty to forty-five feet. The upper edge of this surface is rounded and the soil cover begins a few feet back from the plane of the cliff. After another short rise the level of the plateau is reached (Fig. 6). When the upper part of the lower slope is removed, it is seen that the limestone has been eroded in such a manner as to form an overhanging cliff. Where the overhang was great enough to provide some shelter from the elements, ancient man found a suitable dwelling. In some places the overhang is uncovered at present; in others it is not. It is probable that all sites occupied by ancient man were open at the time he occupied them, for he is not known to have had any implement which would have served for excavating. Elevation above the usual flood-water height of the river was apparently a vital factor in the selection of any of these shelters, and those occupied during the earlier periods appear to be higher than all others. The earliest shelter at Le Moustiers is seventy-eight and eight tenths

[5] See map in MacCurdy, G. G., *Human Origins* (New York, 1924), 1 : 257.

feet above the level of the Vézère,[6] whereas that at La Madelaine, a short distance downstream, is not more than twenty feet above the river.[7] These two sites are the type sites referred to previously. The sites near St. Léon, upstream from Le Moustiers, are all well above the average river level. It is interesting to note that the Vézère at present flows near the foot of the steep valley sides where the prehistoric sites are found.

The way in which prehistoric man lived can be known only in very general terms. What is known has been gleaned from those

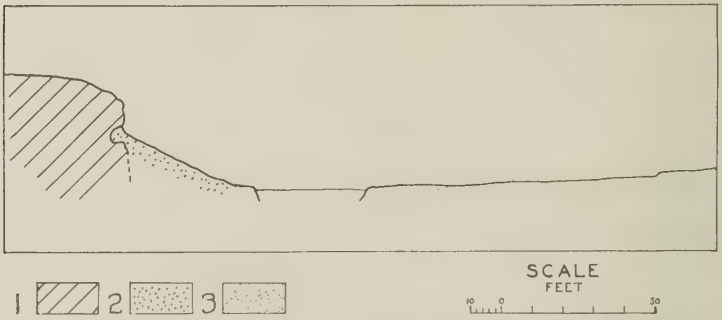


Fig. 6. Diagrammatic cross-section of the Vézère Valley just below Sergeac. Explanation of symbols: 1, limestone, of which the plateau is made; 2, colluvial base; 3, river deposits. Horizontal and vertical scales the same

remnants of his culture which have withstood the element of time. The implements which have been found in excavating the sites indicate that he who occupied them was primarily hunter and fisher. The drawings which adorn the cave walls and shelter roofs show a considerable variety of fish and animals. The horse, the bison and the red deer are among the most common of the animals.[8] The remains of bones mixed with implements indicate that meat was used as an important part of the diet of the inhabitants of the caves and shelters. Charred bone, among other things, indicates that man of this time knew fire and its

[6] MacCurdy, G. G., *op. cit.*, 2 : 364.
[7] *Ibid.*, 1 : 184.
[8] *Ibid.*, 1 : 268.

uses. But there is nothing to indicate whether or not he knew anything of agriculture. In the art of the paleolithic period representations of the plant life are few and are somewhat to be questioned.[9] It has been rather definitely suggested by prehistorians that man of the paleolithic period was not an agriculturist.[10]

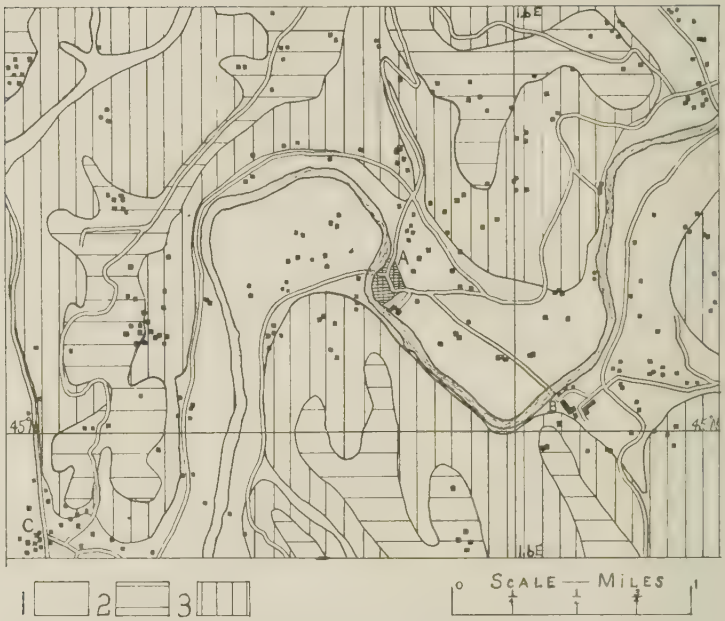
In decided contrast to the occupance by ancient man, so far as it is known, is that of the present. The pattern of settlement distribution is primarily a function of the surface feature pattern. In general terms, the flat land of the valley floor and the remnants of upland surface are areas of concentration of present-day cultural forms, whereas the slope lands are less changed. The roads tend to follow the outer edge of the valley flats or the edge of the upland remnants. They avoid steep slopes wherever possible. The houses have a similar distribution. The steep sides of the valley are not generally occupied. Where the few tributary valleys join the main valley or where the steep slopes give way to the flats without an intervening gentle slope, some settlement is found. The gentle valley slopes have very few houses, although in some places the land is cultivated. The upland is rather sparsely populated. It is used, however, for some crop production and for grazing. By far the greater part of the population is concentrated in the valley bottom.

There is a tendency toward agglomeration in villages both on the relatively sparsely populated upland and in the valley bottom. On the upland the villages occupy sites where the flat land gives way to the gentler slopes. This appears to be due to a more or less conscious effort to secure all possible level land for agriculture and to a desire to control the easiest way into the valley. In the valley bottom the villages are in portions of the flats which, because they are higher, are less subject to flood, or where, because of the occurrence of a small area of relatively poor soil, cultivation of the land is difficult or unprofitable.

The villages of the upland are usually smaller than those of

[9] MacCurdy, G. G., *op. cit.*, 1 : 285.

[10] Man of the neolithic period did practice agriculture. See Furon, R., *La Préhistorie* (Paris, 1928), p. 135.



MAP 22. Section of the Vézère Valley and adjacent upland, showing distribution of houses and roads in relation to surface divisions. Explanation of letters and symbols: A, St. Léon; B, Sergeac; C, Le Moustiers; 1, valley bottom; 2, upland remnants; 3, slope lands

the valley bottom. They consist of groups of fifteen to twenty houses at the intersection of two roads. One of these roads leads along the upland remnant, but the other connects the upland with the valley bottom, usually following a more or less circuitous route on a relatively gentle slope. These villages are dependent for their outlet on the valley and appear more integrally a part of it than of the upland. The small mud-brown clusters of houses form a conspicuous part of the scene when viewed from the valley bottom

A section of the valley about eighteen miles upstream from the confluence of the Vézère and the Dorodogne illustrates the usual valley landscape (Map 22). There is one village on each

flat and each occupies a different type of site. Sergeac (Pl. XX, Fig. 2) is near the end of a valley flat where the flat gives way to a gently rising valley side. It is at the downstream end of the flat, where relatively easy access to the upland is possible. St. Léon is on the outer edge of a valley flat opposite a spur against which the river is flowing. It occupies the same general position with reference to its flat as does Sergeac, but it differs in one respect. It controls the best fording place on the Vézère in this section of its course. Le Moustiers is on the lower portion of a steep valley side and the adjacent flat area. This site is at the junction of a tributary valley and the main valley. Le Moustiers differs from the others in that it is not on the downstream portion of its flat. It does, however, control the best route across the plateau to Périgueux, the principal urban area of Dordogne.[11]

These villages are all similar in character and two of them, Sergeac and St. Léon, are grouped near châteaux. Portions of the main roads form the principal street of each of these villages. Rows of two-story houses line both sides of this street. Small shops occupy part of the lower story of some of the houses. It is, however, very difficult by outside inspection alone to differentiate between them and any of the other houses. An occasional opening of about eight feet in width gives access to the section back from the street. Behind each house a small garden is to be found. Still farther back there is another row of houses. The arrangement tends to be of a rectangular pattern, although it is irregular.

St. Léon may be taken as an example of the village type. It is limited to the east along the main road by château grounds. On the west the old river fording place is now crossed by a bridge. The main road on the left bank of the Vézère crosses the river here to join the main road of the right bank which comes in from the north (Pl. XXII, Fig. 1). At the intersection a small opening is formed bearing the important name of Place de la République. It is backed by the most imposing structure in the village, the town hall. On the river bank, halfway from the bridge to the

[11] See map and table in Saillens, E., *Toute la France* (Paris, 1925), pp. 62–63.

wall surrounding the château grounds, stands the church, a large barnlike structure. The land is not built up immediately about the church. The square there formed is also dignified by a name, Place de l'Église. The area inclosed by the main road, the château wall, the church square and the river is packed with houses. Narrow passageways partly paved with water-worn pebbles separate each row and give access occasionally to the main road (Pl. XXII, Fig. 2). To the east of the main road there are two lines of houses separated in the same way as those on the opposite side.

The older houses are built of irregular limestone blocks partly covered with a thin coating of plaster. The roofs are made of flat pieces of limestone laid in corbelled-arch fashion. A few of the houses are whitewashed, but most of them are of the yellowish brown color of the original plaster covering. The newer houses (Pl. XXIII, Fig. 1) are frame buildings with a covering of stucco. Tile roofs and slate roofs are now most common. The houses that are away from the villages are of the same types. With each there is a barn of similar construction. Often one side of the barn roof is extended at a lower angle to form additional partly sheltered storage space.

In addition to the gardens which are found with nearly every house in the village, the inhabitants of the village cultivate small plots of ground on the valley flat or on the lower slopes of the valley sides (Pl. XXIII, Fig. 2). The fields are usually much less than an acre in size both on the flats and on the valley sides. Wheat and corn are the grain crops, and together they are about equal in importance to potatoes and other vegetables. Fruit trees, including apple, pear, peach and plum, are grown irregularly. No land is entirely given over to orchards. Formerly, south-facing slopes of almost any steepness were in vines. Phylloxera caused the abandonment of this production, and the upper slopes are now almost entirely uncropped, though in some places truffle-bearing oaks have replaced the vines.[12] On the upland wheat is the principal crop. Vegetables occupy most of the re-

[12] Blanchard, R., and Todd, M., *Geography of France* (New York, 1919), p. 77.

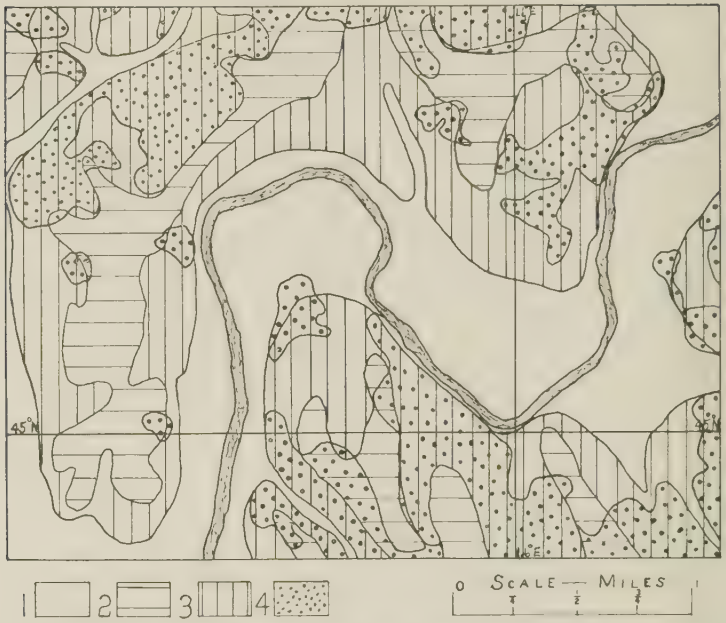
mainder of the cropped land. Fruit trees are lacking and no vines are grown.

The instruments of agriculture are the mattock, the spade and the hoe. Cultivation by plow is not common, although it is used on some of the larger farms. Because of this there is no clear-cut division of the cropped area into fields limited to one crop. A patchwork of crops consisting of a few rows of corn, a band of wheat fifteen or twenty feet wide, and several rows of intermixed vegetables constitutes the usual unit of cultivation. Manure is the only fertilizer used, but, since a rather consistent rotation scheme is practiced despite the small areas cultivated, the yields are rather high. Wheat usually follows corn and is in turn followed by vegetables. The land is then allowed to remain fallow for one or two years, after which time corn is again planted on it. In rare instances a crop of barley is introduced into the scheme and takes the place of the fallow period. Intensive cultivation of small areas rather than extensive cultivation of large areas is the rule.

Associated with this garden agriculture are poultry and hog raising in the valleys and sheep grazing on the upland. Cattle are pastured along the banks of the streams, but they are few. They supply the local demand for milk and meat. Geese are the most numerous of the poultry. Scarcely a household, even in the villages, is without its flock of six geese. Likewise, there is scarcely a household which does not own at least one hog. The combination of hogs and geese accounts for the only product for which the area is known. This product is *foie gras truffé*. The geese are fattened on corn in order that the liver in particular may become fatty and large. The hogs are used in locating the truffles. Thus, the animal industry provides not only an addition to the larder, but also a money crop. On the upland the sheep provide wool for market and meat for local consumption.

No extensive lumbering is carried on in the area, though from twenty-five to thirty-five per cent of the land is in forest.[13] The wood that is cut is used locally for building and fuel. The woodland is almost entirely on the upland and the slope (Map 23).

[13] See map of percentage of land in forest in Bernhard, H., *op. cit.*



MAP 23. Section of the Vézère Valley and adjacent upland, showing distribution of wooded land in relation to land-surface divisions. Explanation of symbols: 1, valley bottoms; 2, upland remnants, 3, slope lands, 4, wooded land

Production in the area is definitely directed toward the supplying of local demand. This country is one of plenty with regard to food, shelter and clothing, but the "extras" or luxuries of life, as known in industrial areas, are lacking. The relatively poor connections with the rest of France emphasize this.

The main railway line from Paris to Toulouse passes through Brive about thirty miles up the valley from St. Léon. A branch railway from one of the less important Paris–Bordeaux lines passes through Les Eyzies, which is some ten miles down the valley. No regular means of transportation exists between Les Eyzies and St. Léon. There is a bus line which makes two round trips every

other Saturday between St. Léon and Montignac, from which town a daily bus operates to and from Brive. One road which is passable for automobiles crosses the upland from Le Moustier to Périgueux.

The people are distinctly agriculturists. Their interest is principally one of supplying the essentials of life by tilling the soil. The animal industries supplement the products of the fields and provide two surplus commodities. Prehistoric research has brought about a slight change. A considerable number of the men are employed because of the fact that prehistoric man lived in the valley. The government employs some as guardians of the caves already explored, others as custodians of museum collections, and still others as inspectors of excavations of sites. Another group, when the crops do not demand their attention, find spare-time employment in performing the rough digging at sites which are being excavated. Many others do some excavating on their own account. A few of these have learned to dig with sufficient care regarding place of occurrence of artifacts, so that their finds have considerable value. Another source of income for a few is the tourist trade, which is on the increase. Most of this trade centers on Les Eyzies and is based on the existence of easily accessible prehistoric sites in the area. The exploitation of these sites is, however, distinctly secondary in importance, and though it cannot be neglected as an influence in the life of the people, it must not be considered the vital factor in their existence.

The presence of remains of occupance during a long passed time appears in strong contrast to the occupance of the present. The complete story of man's existence in this area is not known. Yet, from what is observable, certain relationships and contrasts stand out. The persistence of man in the area shows its suitability for human occupation. Ancient man lived in rock shelters and caves on the steep valley sides and subsisted by means of hunting, fishing and gathering. Present day man lives primarily on the valley flats and lower slopes or on the upland remnants, and he subsists by agriculture. The sites of past occupance are least desired now. The manner of living has changed from purely

destructive exploitation to well-adjusted agriculture. The contrast presented by the consideration of these two types of occupance may serve to emphasize the ever-changing aspect of the landscape, though the detail of the sequent occupance remains to be worked out.

University of Michigan

PLATE XX

FIG. 1. Looking downstream from the bridge across the Vézère River at St. Léon

FIG. 2. The village of Sergeac near the downstream end of the valley flat on which it is located

PLATE XXI

The entrenched valley of the Vézère, showing the heavily wooded steeper slopes. Note how the river has cut below the level of its valley flats

PLATE XXII

FIG. 1. Part of the main street of St. Léon. The town hall is in the right background

FIG. 2. Narrow passageways leading back from the main street, closely built up on either side. Note the water-worn pebble pavement

FIG. 1. Some of the newer houses in St. Léon

FIG. 2. Typical patchwork of crops on the valley flats and the lower slopes of the Vézère Valley

SIGNIFICANCE OF RECREATIONAL DEVELOPMENT IN ROSCOMMON COUNTY, MICHIGAN *

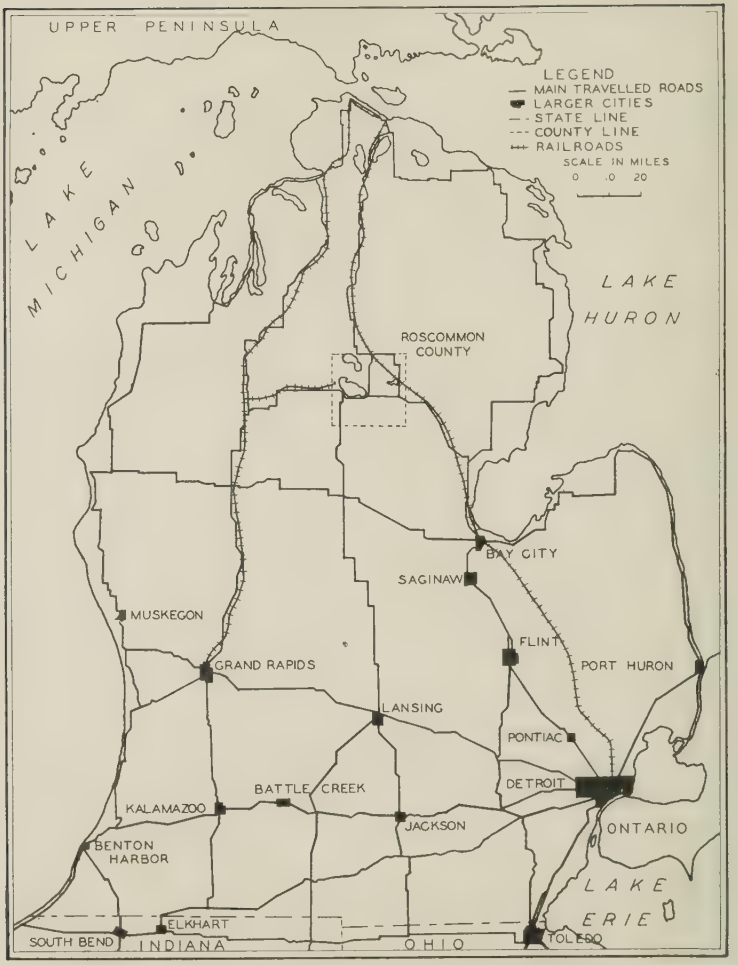
EDWARD C. PROPHET

INTRODUCTION

ALTHOUGH the use of land for recreational purposes is relatively new in Roscommon County, since the earliest developments took place about 1900, it has now reached a stage of development where it is the dominant, if not the only, activity in this area. Up to the present time the recreational activities have been centered about the three large lakes that occur in this county and the resorts that have sprung up here, which are known throughout central-eastern United States and are well patronized by people from that area. The majority of the resorters, however, are residents of southern Michigan, Ohio and Indiana. The development has been that of resorts located about the lakes rather than in the use of large areas of land for game cover to provide hunting of woodland animals. There has been some interest in deer hunting, but not very much. This may become of great significance in the future, since the state now owns about half of the land in the county and has placed it under its administration as a state forest. Game might be propagated and the area used for hunting.

Roscommon County is located in the central part of the northern half of the Lower Peninsula of Michigan and is well

* The facts presented in this paper have been obtained primarily by observations made by the author and by conversations with residents of the area and members of the staff of the Land Economic Survey, Department of Conservation, State of Michigan, who surveyed this area in the year 1924. For this reason it is impossible to present footnotes and authorities for the facts used.



MAP 24. Centralized road map of the Lower Peninsula of Michigan

within the confines of the area known as the "High Plains" (see Map 24). This area is also known to many as the "Pine Barrens" of Michigan. Its resources are meager, to say the least, but fortunately for this county there are some special features in the form of the three large lakes and these have been the basis for its recent development. The objective of the author in this report is to study these special resources, describing them and the manner in which man has attempted to utilize them, as well as the limitations to the type of utilization that these resources have forced on man.

HISTORY

The lumber resources of the county attracted a large number of settlers from about 1875 to 1885, and as the pine was cut and this resource diminished many of the residents left the county, so that the total population fell steadily until about 1894. Some lumbering operations continued until about five years ago and provided casual employment, as well as a market for farm produce, so that since that time the population has remained at about the same figure, with minor fluctuations.

Many speculators in land had thought that the farmer would take up the land after the lumberman cleared it and that the county would be able to support a large number of farms, but that has not been true. The soil is a poor sand in most places and has become very infertile with the repeated burning of the grass and brush cover and the resulting destruction of the humus. Even in the first place it did not provide a great opportunity to the farmer, and as time has gone on it has become progressively less attractive to the agriculturist, owing to the decreasing fertility caused by the fires and the loss of local markets formerly provided by the lumbering operations. The landowners were hard pressed to find some use for their land that would yield enough revenue to pay taxes, not to mention profit, so that large tracts have been allowed to revert to the state because of tax delinquency. Some land is still held in the hope that eventually it can be sold at a figure high enough to cover the cost of taxes paid on it since the lumber has been taken off. As early as 1900

some of the landowners tried to develop large resorts near the lakes, but most of these efforts were not successful, since it was difficult to reach the lakes. It was not until the general use of the automobile, which came, apparently, about 1910, and later the construction of good roads to this section, that there was much hope for a general recreational use of this area.

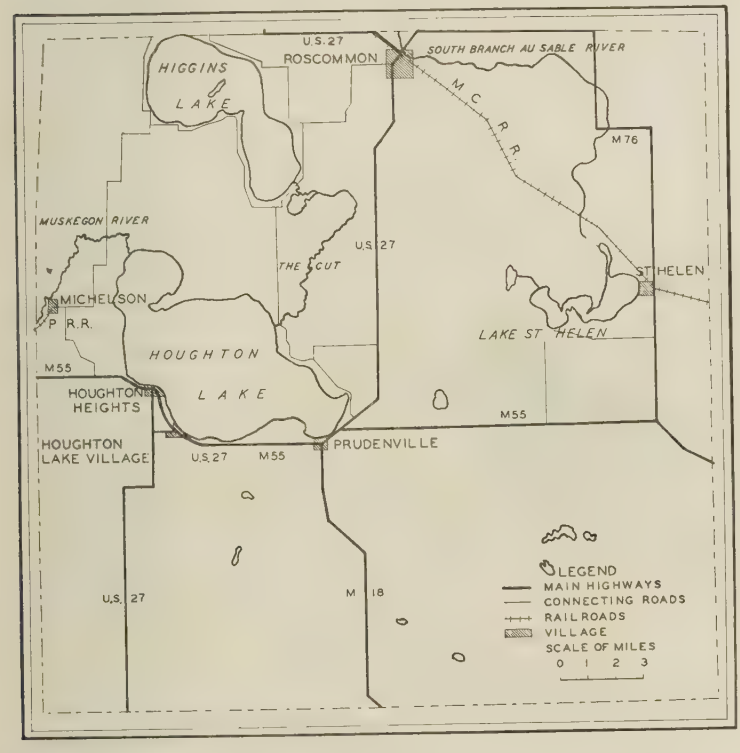
TRANSPORTATION

Map 24 shows the location of Roscommon County in relation to the more populous areas of the Lower Peninsula of Michigan and also the location of the present routes of state highways and railroads. The accessibility of these resorts has had much to do with their recent rapid development and their popularity.

During the period when the county was being lumbered there were only two routes by which people could reach the lakes. These were the Michigan Central Railroad, which cuts across the northeast corner of the county, and what is now called the Missaukee Branch of the Pennsylvania Railroad, which just enters the western edge of the county near Houghton Lake. A few hardy adventurers would come overland from Bay City, Saginaw or Lansing each season, but this was more of a stunt than a practical means of transportation. It was possible, but not feasible. The Missaukee Branch served a lumber town called Michelson, and little or no effort was made to develop any resorts on Houghton Lake at that time. The Michigan Central passed within half a mile of Lake St. Helen in the northeastern part of the county and it was natural that an early effort to use the area for recreation should take place there. The largest town in the county was Roscommon, located on the Michigan Central Railroad near the northern limit of the county. About seven miles west of Roscommon, on the northeast shore of Higgins Lake, a large, aristocratic resort was established about 1895 and additions were made near it from 1900 to 1903. These resorts developed because they were nearer than other parts of the area to suitable transportation.

The Missaukee Branch has had little or no contribution to make to the resort industry of the county except that it is now important for the shipping in of building supplies for the con-

struction of cottages along the south margin of Houghton Lake. It is the irony of fate that this line, which shipped much lumber out of the county for three or four decades, is now kept alive by the shipments of building materials, mostly lumber, into the county.



Map 25. Roscommon County

Almost without exception everyone coming to the county to enjoy its resorting facilities travels in an automobile or bus. The state and national highways are the all-important lines of communication. U.S. Highway 27 enters the county at the southwest (see Map 25) coming from Lansing, and extends northward to

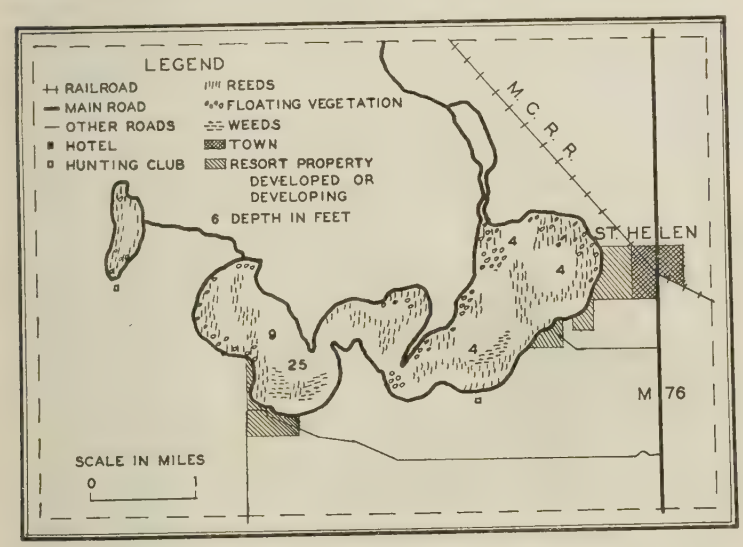
Houghton Lake, along the south end of the lake to Prudenville, and northward again to Roscommon, where it leaves the county and continues to Grayling and Mackinaw City. Highway M–55 comes from West Branch, which draws traffic from southeastern Michigan, extends westward across the middle of the county and continues westward to Cadillac. It passes the south shore of Houghton Lake and the series of resorts and villages now located there and coincides with U.S.–27 for eight or ten miles. Highway M–18 brings traffic from Flint, Pontiac and other southeastern Michigan cities, as does Highway M–55 also. The route of M–18 is through the middle of the county, terminating at Prudenville, which has grown up where U.S.–27, M–18, M–55 and the southeastern end of Houghton Lake meet. Highway M–76 runs from West Branch, leaving route M–55 just after entering the county, and goes north along the east side of the region to St. Helen, continuing northward to the north end of the county, and west to Roscommon. Roscommon, at about the middle of the north side of the county, is about two hundred miles from Detroit, the distance varying slightly depending on which highway is considered. The lakes of Roscommon County are within two hundred miles of a large urban population and are easily accessible with the modern automobile on the present well-kept roads. The distance is not very great if one takes into consideration the speed of the present-day automobile.

THE LAKES AND THE RECREATIONAL DEVELOPMENT ON EACH OF THEM

Lake St. Helen

Lake St. Helen is located in the east-central part of the county. It is really a directly connected series of three shallow, reed-filled lakes. In a few places the banks are high and one can look out over the lake, but in most places the banks are low and even swampy. One wonders just where the swamp ends and the lake begins, since the lake appears to be filled with reeds, rushes and other water-loving types of plants. There are many places where one can stand on the bank and not see any open water at all.

(See Map 26.) This lake is very shallow. Soundings made by state research men indicate that there are very few places where the lake is more than ten feet deep and that much of it has a depth of less than five feet. There is one deep spot, shown on the map, where the depth is indicated as twenty-five feet. The lake is fed by a number of short streams and by some springs at



Map 26. Lake St. Helen and vicinity

the southwestern end. There seems to be a large artesian basin here, as is indicated by the presence of flowing wells on all the abandoned farms in the vicinity, and it is reported that water wells up in the lake near its southwestern margin. This lake is the source for one of the branches of the Au Sable River and provides it with a steady and reliable supply of water. On account of its shallowness and the fact that it is reed-filled, this lake presents almost ideal conditions for wild ducks. It is not attractive to the resorter except near its western margin and so this phase of development has been lacking until recently. About

twenty years ago a group of wealthy hunters became interested in this lake and purchased some land in order to get hunting rights. They later obtained exclusive control of these rights by leasing on a long-term basis those which were held by the owners of the rest of the property adjoining the lake. These other owners controlled many thousands of acres of land near the lake, but were concerned about disposing of acreage and had no interest in the lake for recreational use. Since then, chicken farms, ranches and general farms which they promoted have failed and now the group of original owners are devoting their efforts to the resort development of Lake St. Helen. They regret the lease of the hunting rights to the group of wealthy hunters, now known as the St. Helen Shooting Club, and have been carrying on a long series of litigations in an effort to break the lease, but so far without success. The St. Helen Shooting Club has been interested in the lake on account of the possibilities for hunting ducks and they have done all in their power to keep up the quality of the hunting. They have invested a large sum of money in the venture and have enjoyed good duck hunting and privacy. The general public is not allowed to hunt on this lake, so that the development of its recreational use has been arrested, but it is being put to an ideal use, since it is not an attractive lake to the average resorter. Its real use has been limited to a week or two a year, since that is all the time that is allowed for hunting. This means, then, that any great resort development is lacking, since the season of use is so short.

Fishing has attracted a number of resorters, but this resource at present is not known to the general public, so that only a few individuals utilize it.

An organization called the St. Helen Resort Association, Ltd., composed of the original owners of a big block of land south of the lake, has been promoting the resort development of this area. It has made two efforts, one at the eastern end near the town of St. Helen, and the other at the southwestern end, near the artesian basin previously mentioned. The effort to develop a resort near the town has met with only mediocre success, but the one on the west end of the lake has been reasonably suc-

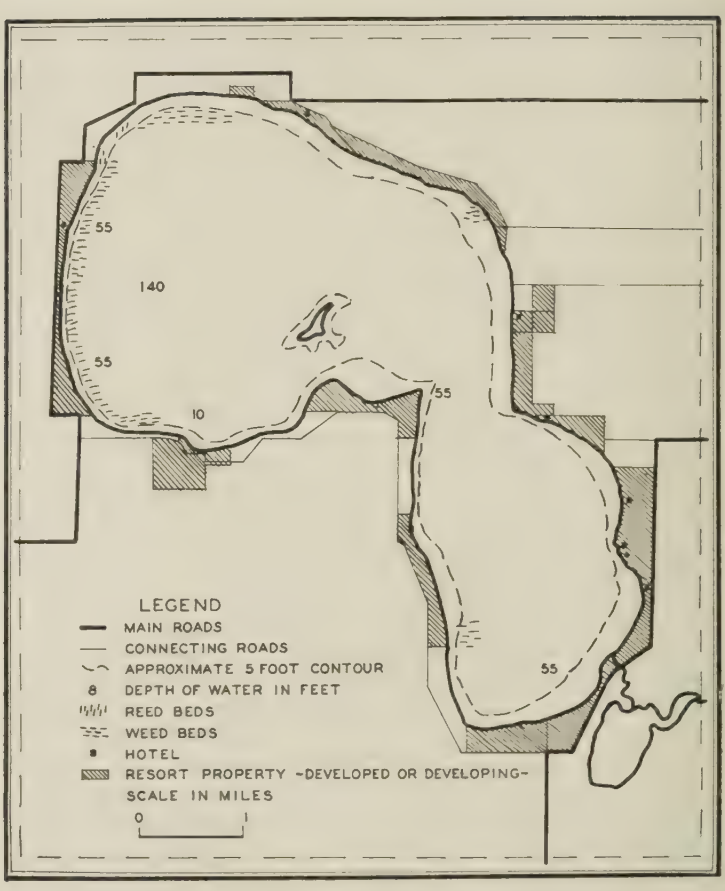
cessful. It is called Artesia Beach and is actually a real-estate sales scheme. Many lots have been sold and twenty-five or thirty cottages have been built, but this is not really a big development. It is meeting with moderate success, but the lake is not one to appeal to a large number of people. Its primary use is that of duck hunting, which is limited to a selected few.

Higgins Lake

Higgins Lake (see Map 27) is located in the northwestern part of Roscommon County and is about twelve miles from Lake St. Helen as the crow flies, but about twice that distance by highway. There is little or no swampy land adjoining it and in most places it has a fine sand beach. The shore consists of steep bluffs in the northeastern part, where about 1900 a permanent resort was established, as was mentioned above. The original timber was left on this small tract and it is now the finest resort site on the lake, with its virgin timber, the steep bluffs and the many up-to-date improvements that have been installed. No expense has been spared and it has an air of refinement and substantiality that no other resort in this area possesses.

In most places the shore rises gradually from the beach to the general upland. The lake bottom slopes gently offshore until about the five-foot depth and then it suddenly drops off to about fifty or fifty-five feet in depth. This drop-off is located at least two hundred yards from shore and in most places is much farther out.

It is ideal for bathing, since there are no holes until the abrupt drop-off is reached, and that is so far out from shore that children are in no danger of getting suddenly into water that is too deep. The main objection that one finds to the swimming conditions is that stones occur and that an adult has to walk out so far to get water deep enough to swim in. These can be easily removed if the owner is sufficiently interested in improving his beach and bathing facilities. There are very few weed beds and the lake has a clean and wholesome appearance. It is fed by a number of springs along its northern shore line and is drained by a rapidly moving stream into Houghton Lake, which in turn is the source of the Muskegon River. The overflow from Higgins Lake is very



Map 27. Higgins Lake and vicinity

great, so that much water must be delivered to it by the springs which feed it. On account of the fact that it is spring-fed and that it is very deep, fifty feet and over for the most part, the water is very cold and is not suited to comfortable bathing until July or even August. With the first signs of fall the water cools down

rapidly, so that bathing is limited almost entirely to the months of July and August and the first two weeks of September. There is some fishing, but not so much as one might anticipate, since there seems to be a shortage of food for the fish. The lake has varied interests and appeals to an individual who desires a safe place to take his family, where outdoor recreation is available and where one will not be molested by transient visitors. Most of the land adjoining the lake is covered with a growth of poplar, oak, spruce, fir and a few pines. It is a fine place to roam in the woods and study nature. Most of the resorters own their cottages and bring their families up to the lake as soon as the schools close in the early summer and stay for the entire vacation. All members of the family enjoy it here. The result is that the owners put in many permanent improvements and have very substantial homes. The resort represents a conservative, substantial sort of development and has been steadily increasing in size. The better sites have long since been used, but there is still much good lake frontage that has not been developed. This is being utilized rapidly now and many new cottages have gone up each season.

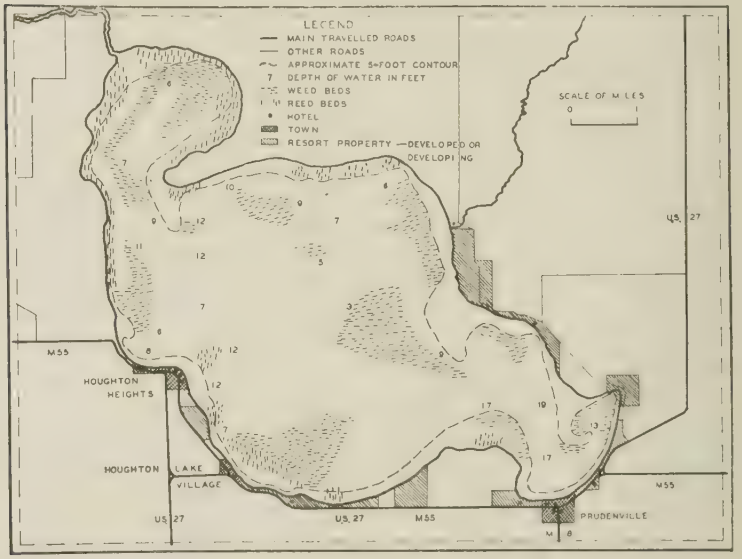
There is a boy-scout camp, sponsored by a Detroit church, on the north shore of the lake. This is the only organized camp in the entire development. There are a number of summer-resort hotels along the east shore of the lake which in most seasons do a very profitable business. Ordinarily one needs to reserve a room some time in advance in order to be sure of having accommodations when one wants them.

Higgins Lake is a summer resort. It is used for about two or three months each season and then everything is closed for the year. It is a paradise for the "perennial" resorter, if one may use that term to signify an individual who comes back to the same resort year after year. The development has been slow, but substantial.

Houghton Lake

Houghton Lake is located in the central-western part of Roscommon County and is the largest inland lake in Michigan. In spite of its size, it is shallow. (See Map 28.) A large part of the

lake does not exceed twelve or fifteen feet in depth and there are some very shallow spots well out from shore. In some places as much as a mile or two from shore the water is only twenty to forty inches deep. There are many weed beds, and reeds and rushes protrude above the water in many places. The bottom



Map 28. Houghton Lake and vicinity

in some places is sandy, in others, mucky, and in still others, gravelly. The muck bottom predominates, however.

Only in places where the owners have removed rotting bits of vegetation and have provided a sand bottom to the lake near their bathing beaches have swimmers been attracted to the lake. The lake is known for its fishing and it is surprising that it has not been fished out long ago. When one considers the large number of people who come to it, rent a cottage, and go fishing every day during their stay, one wonders just where the fish come from. In addition, the boat liveries do a large business by

renting boats for a few hours or a day to passing tourists who see the lake and, noting the number of boats anchored on the fishing grounds, decide to try their luck. The weed and reed beds provide a tremendous amount of food for the fish and also for wild ducks at certain seasons. Houghton Lake's reputation for fishing and duck hunting is well established.

The south and east shores are the most attractive, since some well-drained ground occurs there. Elsewhere the shore line is a marsh and is unoccupied except by the ducks during their seasons of migration. Along the north shore there is also some well-drained land, but it is a narrow strip along the lake and is cut off by marshes from the roads that serve this general area. The marshes bordering the lake are very desolate places even in fine weather and in rainy and cold weather are unbearably bleak. I doubt whether anyone has ever entered these marshes or stayed in them for any length of time without feeling that he is indeed a lost soul. The feeling that pervades these areas is almost uncanny, so that one would not attempt to settle there even if he could find a suitable place to build. These marshes are very extensive. If the lake level were raised about two feet, the area covered by water would easily be doubled.

Fortunately, the south shore of the lake is well drained and in a few localities bluffs about twenty-five feet high exist. The main highways extend along this shore and make it very accessible. Also this is the first part of the resort development in the county that the tourist sees. The entire south shore of the lake has been subdivided into summer-resort lots and many of them have been built on. There are many summer-resort hotels that cater to the passing tourist as well as those that serve only resorters who come to enjoy the lake and stay awhile. Accommodations of any and every sort are to be found along this shore. A great deal of advertising is done and an effort is made to attract crowds, if only for a single day, by staging some special celebration. A more sporty class of people is to be found here than at either of the other lakes that have been discussed. It is a crowded, boisterous and noisy group. There are a few expensive homes and quiet, select hotels, but the cheap type predominates. Much the same

condition holds true for the east shore, with the exception that its development has been more recent and it is a little more difficult to reach. The result is that the crowd is not so great and more of the people interested in spending their vacation fishing patronize the hotels.

At the west end of the development along the south shore there is a golf course that is much used and has been a very profitable venture.

Many of the owners of cottages come up to them during the winter and spend a few weeks or even just a week-end. This is made possible because the main roads pass close to most of the cottages and the state keeps the roads open even during the worst weather. It would be difficult to reach Higgins Lake at any time during the winter, since the county authorities might not have cleared the roads, but that is not true for the south shore of Houghton Lake.

The growth of this resort development has certainly been phenomenal. The actual number of buildings has doubled in the five-year period from 1924 to 1929. Owing to the general depression since 1929 there has not been much new construction, but plans are under way to push the sale of lots and the construction of cottages once general business conditions within the country as a whole have improved. One man who a few years ago purchased about 1,500 acres of land adjoining the lake on the south has erected a modern hotel and subdivided much of his land. The hotel is on a paying basis, in spite of the short season for this class of accommodation, and the owner has plans laid to push the sale and building of cottages on his lots as soon as general business will warrant. He has studied the methods used to sell resort property in Florida and California, and has worked out a scheme applicable to his own property. He realizes that when people have no surplus money to invest there is no use in trying to sell them resort property. I present this fact to show that these resorts will not languish in the future for lack of advertising, but actually will expand greatly.

Houghton Lake is attractive to the vacationist at all seasons of the year. Fishing is of interest during the summer, ducks

attract sportsmen during the fall, deer hunters on the way north or returning from the north stop over at the hotels of Houghton Lake, and it is sufficiently accessible for parties to come up during the winter for short stays.

CONCLUSION

At the present time the main activity in Roscommon County is centered about the three larger lakes, St. Helen, Higgins and Houghton. There are a few farms, but they are not very successful and their existence is due primarily to the market provided by the resorters. Much of the land not affected by the present recreational developments has reverted to the state on account of the failure of the owners to keep up the tax payments. The land that is privately held is either supporting some phase of the resort business or has a possibility of doing so in the near future, so that it is worth speculating with. Resort property pays most of the taxes collected within the county.

It is interesting to note, in conclusion, the effects which the physical differences in these three lakes have had on the type of recreational industry developing on each. Lake St. Helen is used for only a few weeks during the year by a few duck hunters, owing to the fact that it is shallow and reed-infested. Higgins Lake is slightly off the main trails and is not noticeable to the passer-by. Its gently sloping shore is ideal for bathing during two months of the summer and it has attracted the resorter who desires a permanent summer home where he can bring up his children in a quiet, safe and attractive place. Houghton Lake is a lake where something is going on the year around. It is so located that it is easy for it to attract a crowd and special events take place in all seasons. The fishing is good, the duck hunting is fair, and it is easy to reach in any kind of weather.

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LAND INVENTORY FOR RURAL PLANNING IN ALGER COUNTY, MICHIGAN

LEE ROY A. SCHOENMANN

IN AN article on "Theory and Practice in Land Classification" in *The Journal of Land and Public Utility Economics*, 1 : 160–175, P. S. Lovejoy writes as follows:

> The new period in our land affairs is now well opened. It will be characterized by deliberate and more and more competent inventory of lands and of factors which limit or affect the use of land.
>
> Moreover, it will, I believe, become increasingly apparent that a land inventory is one thing, that land classification and planning for use is another thing, and that putting the plans into practice — the political science or engineering of land utilization — is still a different thing. The three operations are quite distinct; yet all are necessary to achieve intelligent land utilization.
>
> The inventory proper in the case of land should be like any business inventory, as, for example, in the physical valuation of the railroads; it should "express no opinions, offer no advice, and make no plans," but it should assemble all the essential data requisite to the formulation of adequate and workable plans for the utilization involved.
>
> Land classification, on the other hand, involves the making of specific plans for the lands reported upon by the inventory on the basis of the facts found by the inventory. Classification and land planning go hand in hand, for classification is essentially purposive; it looks to the attainment of some end and hence includes planning.
>
> On the basis of the inventory and the classification, there remains the difficult task of transforming the plans into actualities — of putting the theories into practice — or, to phrase it another way, of getting policies in operation.

Recognizing the inventory as a prerequisite to classification and planning, the Michigan Land Economic Survey has proceeded to "inventory" the present-day character, the status of use and the economic environment of the lands, forests and waters in fourteen counties of northern Michigan. Within this area of 6,500,000 acres a great number of private interests and public agencies are now using some of the data that this Survey has assembled for directing their attention to particular affairs or particular lands.

This use of the inventory data is in reality a type of planning based on the "facts found by the inventory," but it is at the same time an uncoördinated and piecemeal use of only the most obvious facts or of those that bear solely on an immediate problem, and thereby falls far short of the inventory's full application and value. So far, however, no person or agency has offered or attempted to do more. Meanwhile, the Survey has held to its adopted policy, to "express no opinions, offer no advice, and make no plans," but concerns itself solely with the further extension of the inventory.

This paper is, therefore, an attempt to formulate a land-utilization plan, as proposed by Ely, Gray, James and others, for the lands and associated resources of Alger County, an area of more than a half-million acres, on the basis of the facts found by the Michigan Survey's land inventory. The inference is that, when the character of these lands, their physical and economic environment, and the history and status of their use are known, then their definite assignment to the one of several possible uses which is in the highest degree of harmony with their character and environment is not only possible but quite easily obvious.

THE INVENTORY

The necessarily long and tedious description of the methods used in making, checking and assembling the inventory may be omitted, since this information is available from other sources.[1]

It will suffice to point out that a standardized technic is followed, with recognized methods of classification which permit the identification and correlation of similar characteristics or values even when they occur in widely separated units of varying magnitude.

A brief review of the variety of the data that the inventory

[1] Lovejoy, P. S., "Theory and Practice in Land Classification," *The Journal of Land and Public Utility Economics*, 1 (1925) : 160–175; Barnes, Carleton P., "Land Resource Inventory in Michigan," *Economic Geography*, 1 (1929) : 22–35; *The Department of Conservation, State of Michigan, Biennial Reports*, 1923–24, 1925–26, 1927–28, 1929–30; Michigan Department of Conservation, Land Economic Survey Division. Forms and Instructions Used by Field Parties. 1928.

assembles is presented here in order to give the facts on which the utilization plan has been rested:

Climate. — The records of the U. S. Weather Bureau are assembled. The sections of the *Atlas of American Agriculture* that deal with climate are consulted. During the course of the Survey evidence is sought in the field of the effect of rainfall, snowfall, hail, extremes of temperature, frost, growing season, wind velocity, etc., on the natural vegetation and farm crops.

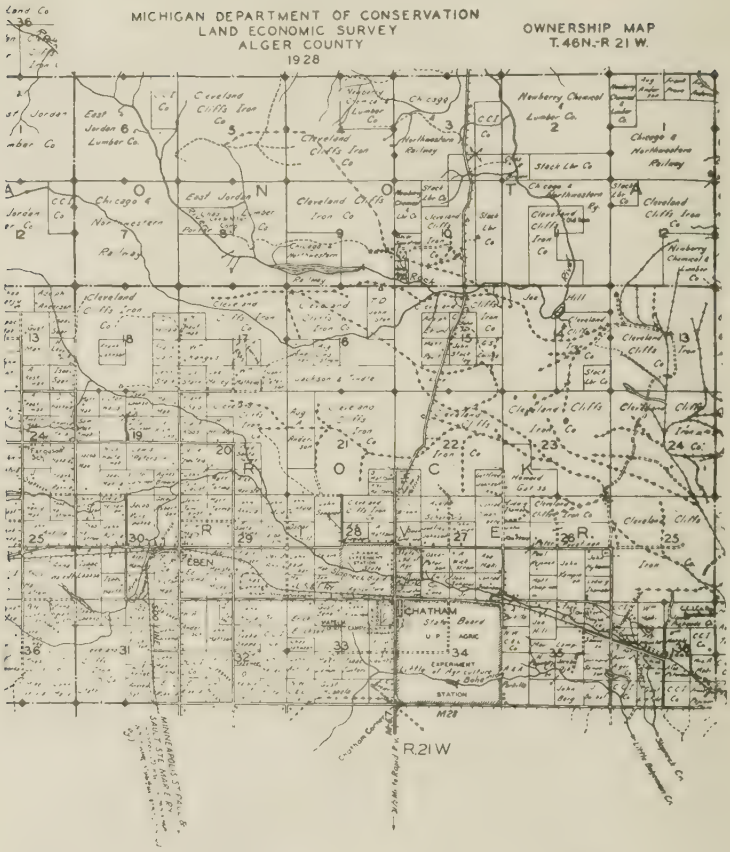
Geology and physiography. — The geological inventory defines the nature and extent of the glacial and consolidated rock formations in greater detail than they were formerly known and points out their possible commercial utility. The geological inventory not only pictures the physiography of the area, but also identifies the causative agencies. It includes an analysis of the mineralogical character of the subterranean waters associated with each important formation.

Lakes and streams. — The mapping of the drainage systems includes all permanent streams and the major intermittent drainways. Records taken on the main streams and their feeders tally width, depth, rate of flow, temperature, color, degree of flooding, character of the bottom, and the presence or absence of aquatic vegetation, boulders, logs, etc.

The sinuous outline of all lakes, ponds and flowage areas is delineated and the principal bodies of water are mapped in greater detail on large-scale maps to picture the soil character of the lake bottom, the nature and extent of the aquatic vegetation, and the limits of the shoal and deep water.[2]

Soil and "lay of the land." — The soil conditions are identified according to the standard system of classification recently adopted by the U. S. Bureau of Chemistry and Soils. All portions of the area are covered with equal intensity, so that the resulting soil map (Map 30) indicates the location and extent of each individual type area of five acres or more. The soil map, therefore,

[2] Further intensive investigation is given to the lakes and streams, in the interests of fish and waterfowl propagation, by the coöperative field work that is carried on by the State Department of Conservation and the Institute of Fisheries Research of the University of Michigan Museums.



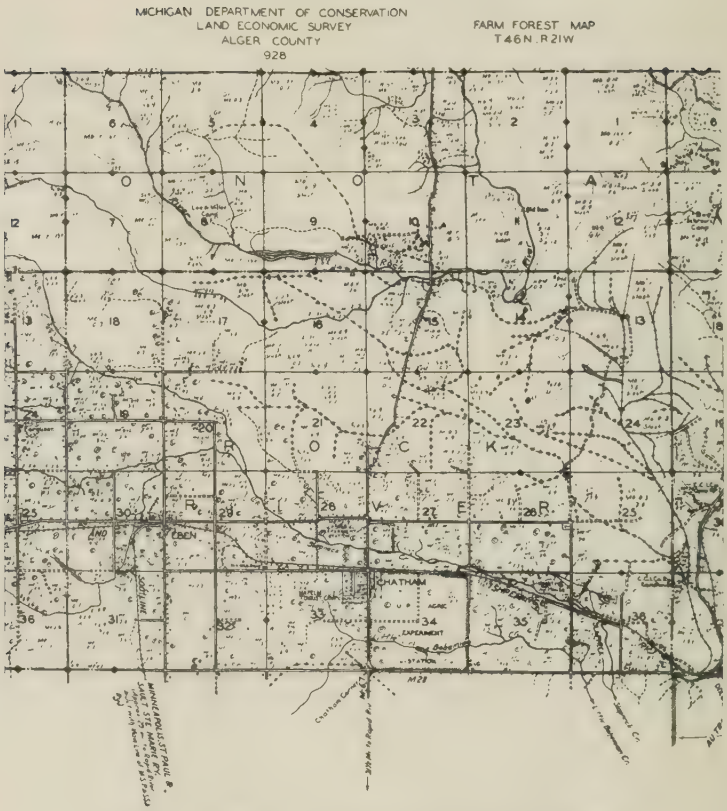
Map 29. Ownership map, Alger County, Michigan

automatically defines soil character, stoniness, degree of natural drainage, natural fertility, durability and adaptation of the land for crops, forests and other vegetation.

Where topographic maps are not available, the "lay of the land" is mapped into five classes that range from level to steep-sloping.

MAP. 30. Soil map, Alger County, Michigan

Forest growth, other natural vegetation and land use. — The farm-forest map (Map 31), delimits the areas occupied by cities and villages, the lands used for farm crops, pastures or orchards, the apparently idle farm land, the extent of the forest growth and the dominant vegetation on the treeless areas. The forest growth is classified into types on the basis of the composition of the stand (associated species) and further subdivided for density and size,



Map 31. Farm-forest map, Alger County, Michigan

so that the areas occupied by mature, fully stocked stands of pine, hardwoods and swamp conifers are clearly distinguished from those with immature and understocked second growth.

Culture. — The "man-made improvements" in roads, railroads, cities, villages, drains, power dams and transmission lines, mines and quarries, industrial plants, sawmills, logging camps, farmsteads, resort hotels, summer cottages, hunting and fishing cabins, churches, schools and other public buildings, etc., are

shown on the "base map." The base maps are "built" on a transfer of the U. S. Land Office plats, as these cultural features and the lakes and streams are encountered during the progress of each day's work. Land ownership, soil types, lay of the land and the items carried by the farm-forest map are added to this common base map. (See Maps 29–31.)

Wild life. — The variety and prevalence of the principal game birds and animals, the fur bearers and certain predators is appraised by a tally of the number seen during the progress of the Survey and the covert or habitat in which they were sighted.

Water power. — The water-power inventory reports on the developed water-power projects and the undeveloped power sites of the major streams. It furnishes a statement of the approximate amount of power that can be developed at each site and makes an estimate of the cost of development.

Economic study. — The history of settlement and of the successive steps of exploitation and development that the area has experienced is gathered from records and interviews.

The present distribution of habitations (permanent and seasonal) is charted in conjunction with the trade areas tributary to the several trading and shipping points (Map 33) in order to emphasize the extent to which human occupation has localized itself and to define the limits of the area within which each trading and shipping point has a dominant influence and a competitive advantage.

The major transportation routes indicate the relative accessibility of the different parts of the area to markets and shipping and trading centers (Map 32).

The land-ownership map (Map 29) shows who owns the unplatted land outside the cities and resort subdivisions. It serves to define the dispersion of ownership by the size of holdings and is the basis for the equally or more significant "intent-in-ownership" classification (Map 36), which allows the grouping of scattered and contiguous parcels that are held by a great number of individual owners, into intent in ownership classes, i.e. farming, timber, recreation, mining, water power, speculation,

etc., so that the lands in each class may be treated as a single unit. This is possible, since all the owners in any single class will have a substantially common interest in their individual holdings.

The charting of assessed valuation (Map 37) expresses the local appreciation of the existence of resources of high actual or speculative value.

The charting of the localization and degree of tax delinquency in conjunction with the dispersion of the lands already in state ownership (Map 38) is significant in indicating the particular lands where actual or apparent values are shrinking in the owners' estimation and where public ownership is likely to expand in the near future through the further accumulation of tax delinquency.[3]

MAKING THE PLAN

The first step in the preparation of the utilization plan (Map 39) consists in making a thorough study and digest of the full detail of the inventory data and their environmental controls. Correlation of these facts with the history of past use, present status of use, and the position of existing use (or lack of use) in its normal trend of progression will identify certain combinations of character and environment as having proved either suitable or unsuitable for particular types of utilization through the evidence of "trial and error" with such utilization. It is not necessary that these correlations rest solely on the results that have been obtained within the area under consideration, since the inventory identifies similar characteristics and values in widely separated units. In fact some of these correlations are so obvious that they need no further support. For example:

Private forestry will not seek fire-cleared areas of dry sandy pine land. Such lands are being discarded to public ownership except when they possess associated qualities that give them a value for uses other than forestry.

Public forestry (national and state) seeks low-value forest

[3] The general tax laws of the State of Michigan provide that lands delinquent for taxes for any five years shall under certain conditions revert to state ownership.

lands which require considerable initial outlays for rejuvenation and a long wait for returns.

The deer-yard type of state-owned wild-life refuge and public hunting ground requires a special and peculiar style of landscape (combination of cover, water and terrain) and may still fail to fulfill its purpose if too closely associated with developed farm lands or if blocked off from expansive areas of wild lands by farm development.

State parks that embrace any considerable acreage find their justification in making some area of outstanding natural attraction available for public use.

County parks have a high utility only when they combine a well-drained forested site with water frontage and bathing facilities conveniently accessible to the county's most thickly populated areas, or when they preserve some historical site or some unusual natural feature and make it available for public use or appreciation.

The summer-cottage type of recreational development seeks access to lake frontage and is enhanced in value and permanence by good roads.

The development of camps for hunting and fishing, on the other hand, depends to a considerable degree on an isolation that permits the secluded enjoyment of these forms of recreation. It finds, therefore, a greater permanence and value in the more remote portions of wilderness areas that are not too easily accessible.

Agricultural development has consistently failed to maintain itself on any considerable area of marsh land or low-grade sandy land. Only the adequately drained, productive, high lime loam and clay loam soils that possess favorable surface features and location have attracted permanent farm development or seem likely to invite its further expansion in the near future.

These generalities have been so commonly and frequently repeated by correlation of the inventory data in the fourteen counties so far completed that they may be axiomatically accepted for northern Michigan. They are resubstantiated by close study of the inventory data of Alger County.

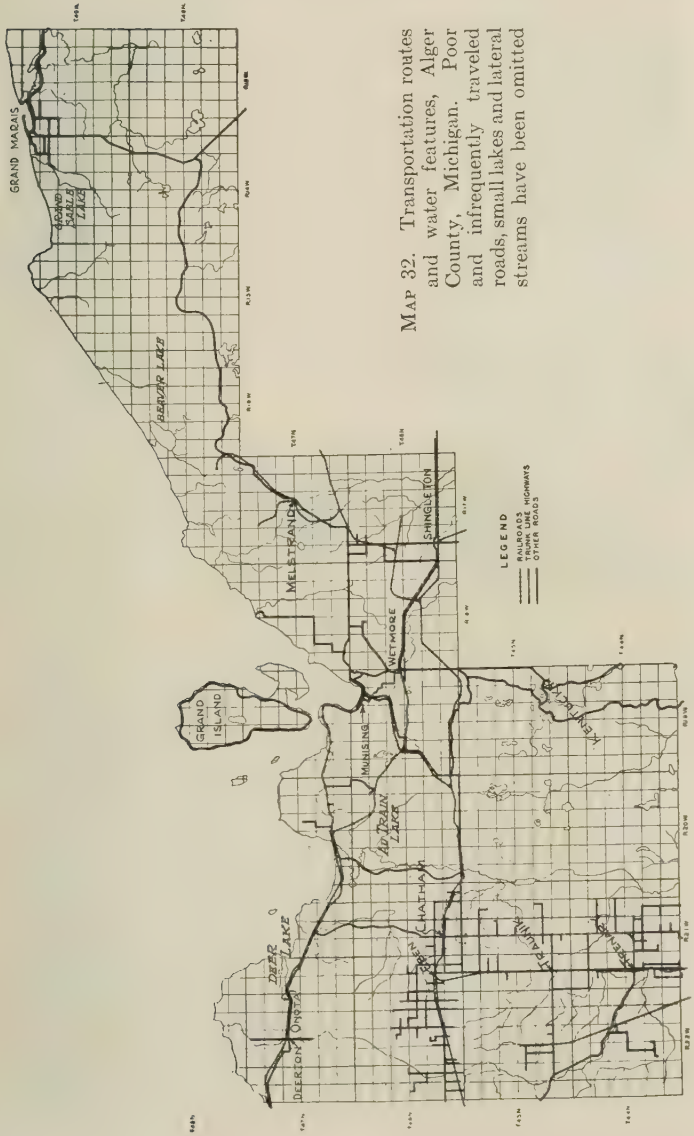
One thing more now remains to be done before undertaking

the assignment of particular areas to certain uses, that is, to reduce the maze of detailed data shown on the soil map (Map 30) and the farm-forest map (Map 31) to the more simple terms of the natural-district map [4] (Map 34) and the land-use and cover map (Map 35), so that the dominant characteristics of the different parts of the county will be more easily apparent.

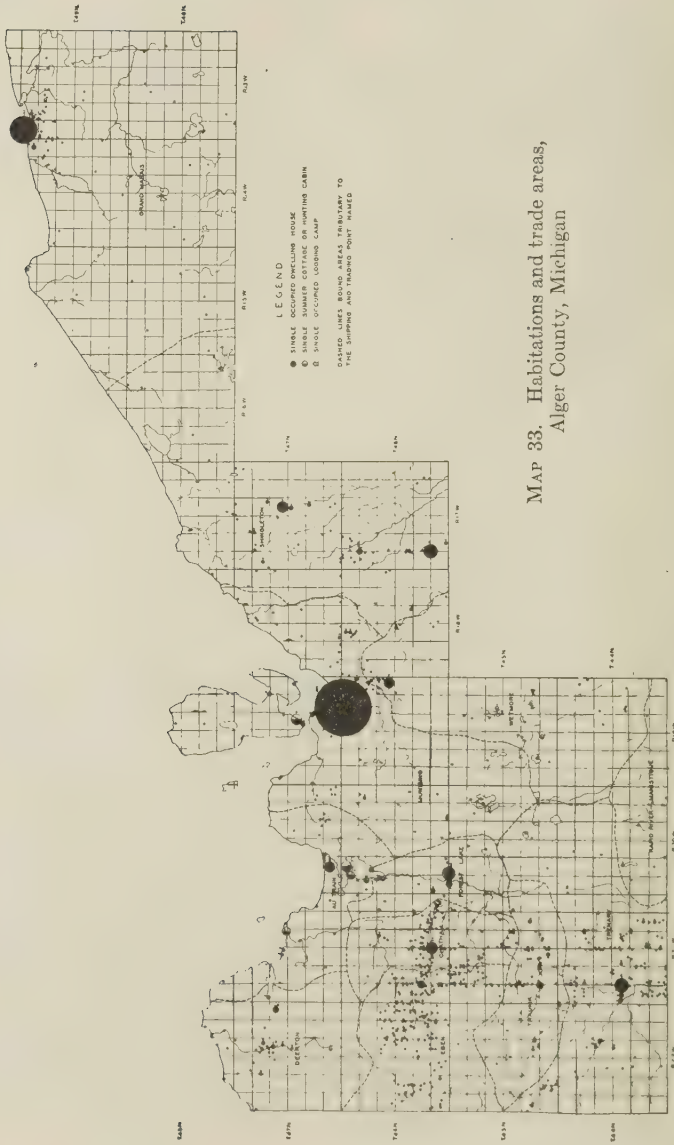
We now have a set of maps (Maps 32 38) on which the details of the inventory findings for physiography, soil, natural drainage, adaption to natural and cultivated vegetation, condition of forestation, water features, distribution of habitation, transportation, local markets, land use, intent-in-land ownership, valuation, trend toward land ownership, etc., have been summarized. By keeping in mind the formerly recited axioms and the policies of the agencies administering public land affairs (national forests, state forests, parks and wild-life refuges) we are ready to start constructing the land-utilization plan.

There are nine natural districts, each possessing a marked unity and individuality of character throughout its entire extent that places it in sharp contrast to each of the eight other natural districts. There are eight possible types of land utilization, each capable of employing considerable acreages of land, namely, forests, wild-life propagation, recreation, parks, agriculture, water power, mining, cities and towns. The problem is to allocate these eight possible uses over the nine natural districts in such manner and extent that every part of the entire area will be used for the purpose to which it is obviously best suited by natural character and environment, while keeping in mind that these uses must be able to maintain themselves in competition with similar uses elsewhere. We may not expect that any one of these possible uses will survive such foreign competition, or even local competition, by the other seven possible uses, except as it may find an unusually favorable natural setting and environment here.

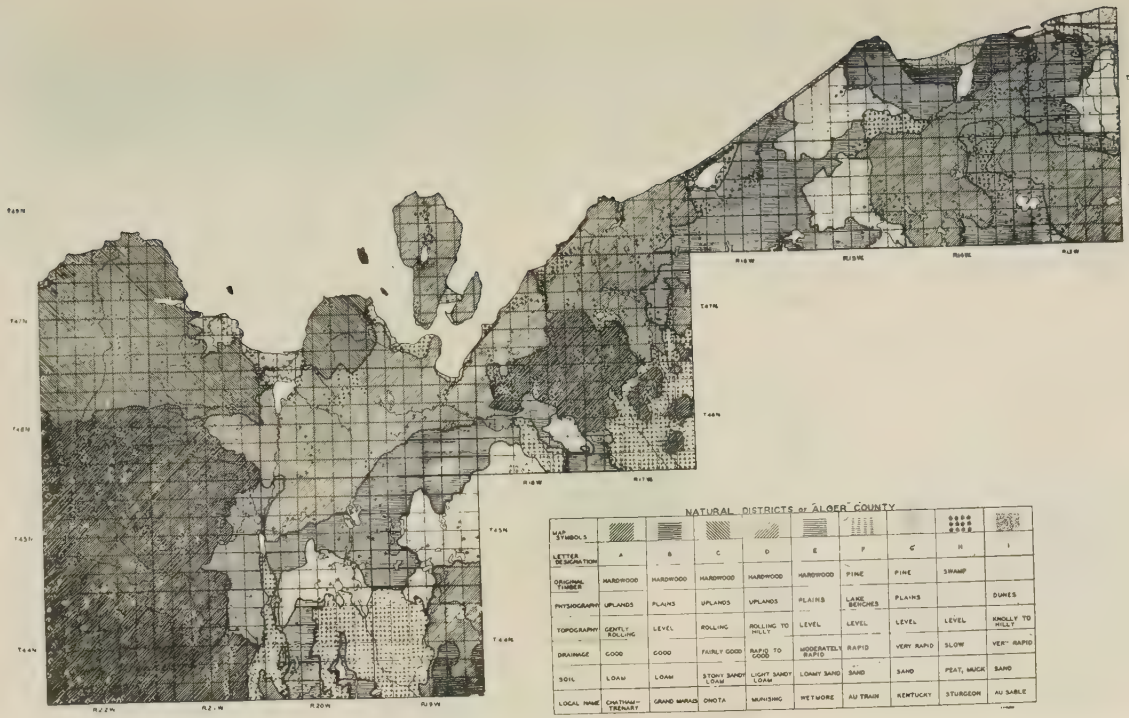
[4] The concept of the natural district was developed by the staff of the Land Economic Survey to provide a basis for correlating the physical and economic characteristics of land areas. Its use for that purpose was described by DeVries in the issue of the *Journal of Land and Public Utility Economics* for August, 1928, in an article on correlation of "Physical and Economic Factors as Shown by Michigan Land Economic Survey Data."



Map 32. Transportation routes and water features, Alger County, Michigan. Poor and infrequently traveled roads, small lakes and lateral streams have been omitted


LEGEND
SINGLE OCCUPIED FISHING HOUSE
SINGLE SUMMER COTTAGE OR HUNTING CABIN
SINGLE OCCUPIED LOGGING CAMP
DASHED LINES BOUND AREAS TRIBUTARY TO THE SHIPPING AND TRADING POINT NAMED

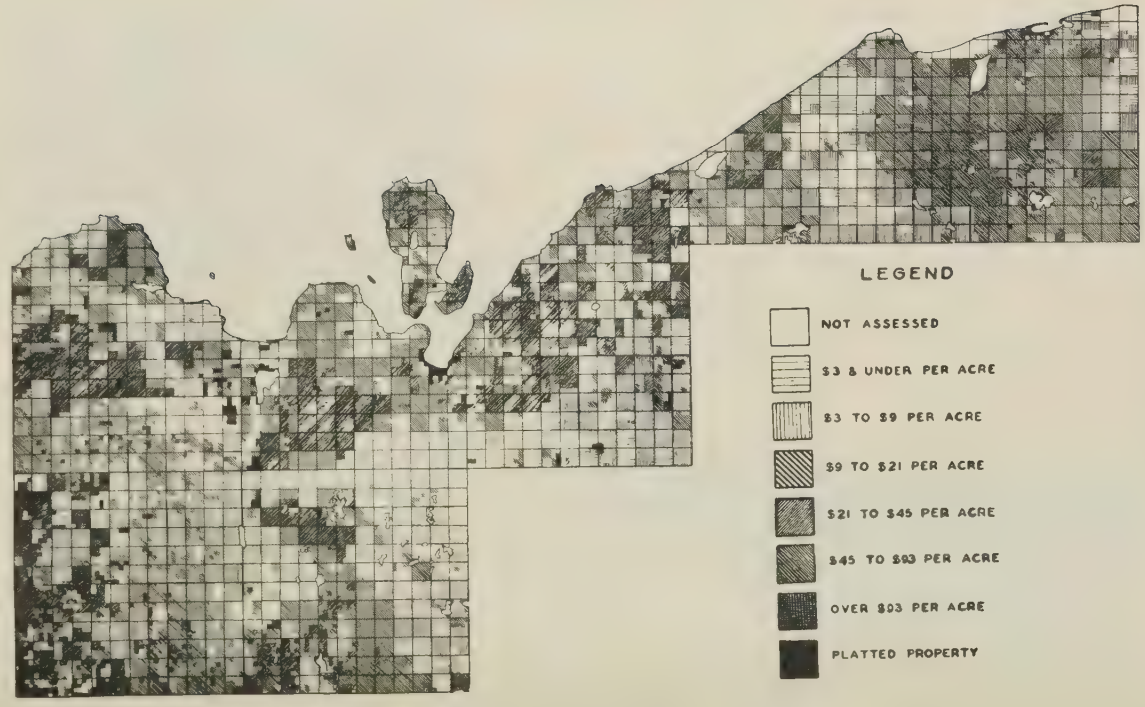
Map 33. Habitations and trade areas, Alger County, Michigan



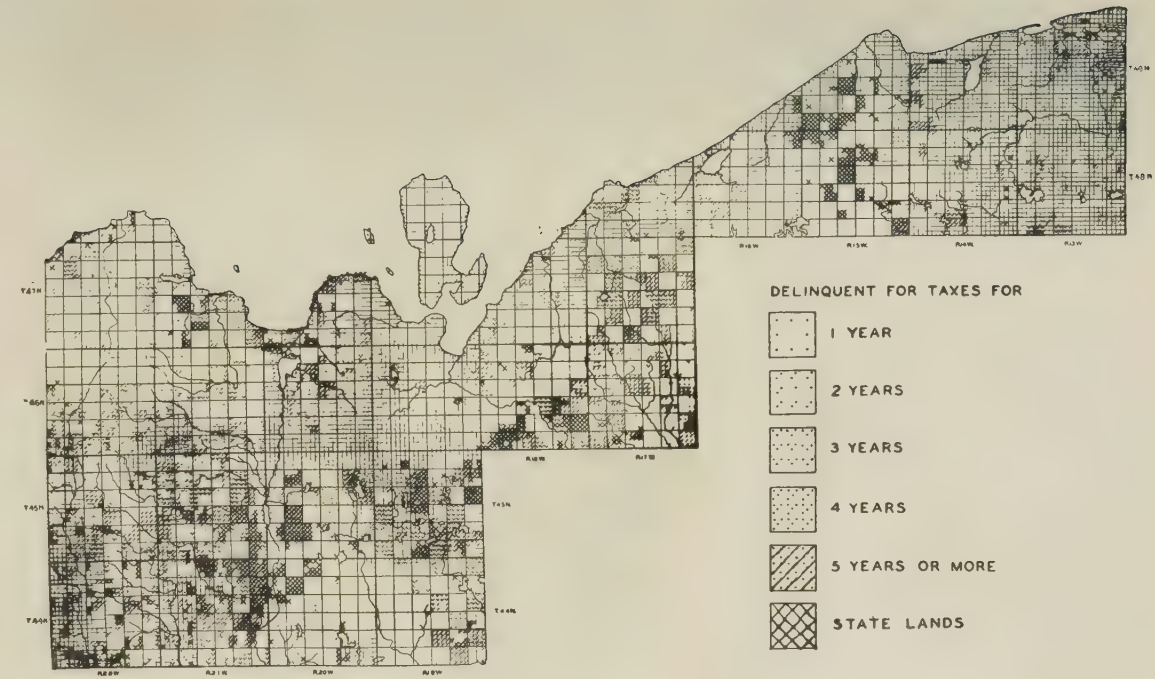
MAP 34. Natural districts, Alger County, Michigan

MAP 35. Land use and natural cover, Alger County, Michigan

MAP 36. Intent in ownership, Alger County, Michigan



Map 37. Assessed valuation, Alger County, Michigan



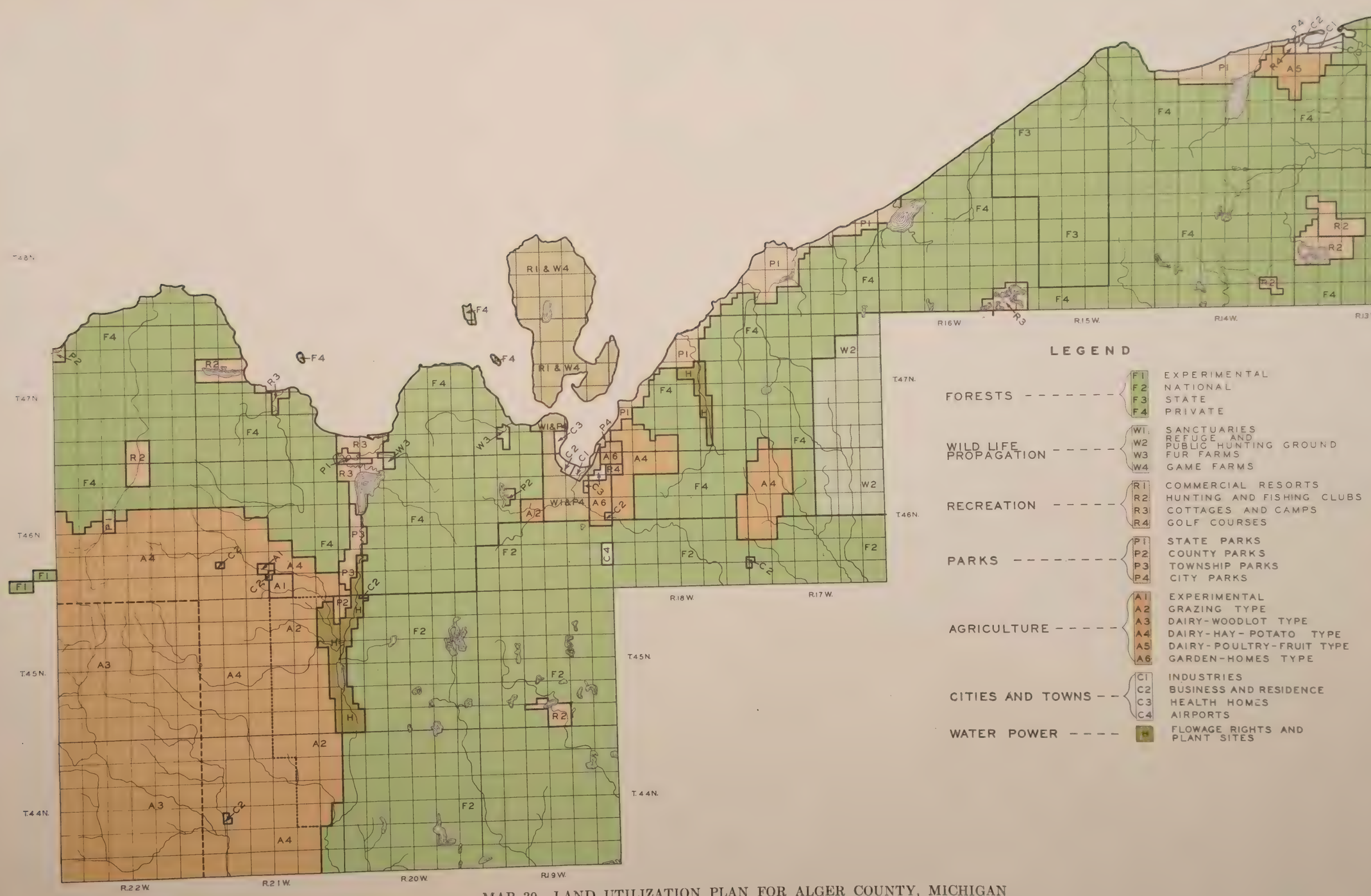
MAP. 38. Tax delinquency, Alger County, Michigan

First, the intent-in-ownership classification (Map 36) is compared with the natural-district map (Map 34) and the land-use and cover map (Map 35). The object of this comparison is to determine where, if at all, the intent in ownership of the present owners is in harmony with the natural conditions. Where the intended use is obviously the correct use, it is at once checked into the utilization plan. As soon as discordant or uncommon combinations appear, the other sources of information and the more detailed data are consulted to establish the history of the use that the owner has in mind for the given conditions, or in the event of non-use, then to establish what particular use has proved most suitable by experience for the given conditions under similar environment. General limits and boundaries are set on the basis of the generalized data. Refinement and precision are then added with the assistance of the detailed data.

FORESTS

From the map of intent in ownership (Map 36) we find that practically all the land with mature forest growth is held for its timber value. The ownership map (Map 29) reveals that these lands are still in the hands of loggers and lumber companies. Their intent in ownership is forestry, at least for the present and until the growing forest crop can be harvested. These owners, as a class, contend that under present systems of real-estate taxation their interest in forest production on their holdings is limited to the harvesting of the present mature forest crop and that they are being forced into an operating policy of "cut, junk and jump," which is throwing cut-over lands into tax delinquency at an alarming rate.

Forest interests, both private and public, declare that this policy is contrary to the public welfare because it prevents the private owner of forest land from conducting his operations in accordance with sound conservation principles which would assure to forestry the continuous use of lands best suited to it. They promise that under equitable taxation they will devote to continuous forest production considerable areas of land that are "producing or are suitable for the production of forest products."



LEGEND

- FORESTS
  - F1 EXPERIMENTAL
  - F2 NATIONAL
  - F3 STATE
  - F4 PRIVATE
- WILD LIFE PROPAGATION
  - W1 SANCTUARIES
  - W2 REFUGE AND PUBLIC HUNTING GROUND
  - W3 FUR FARMS
  - W4 GAME FARMS
- RECREATION
  - R1 COMMERCIAL RESORTS
  - R2 HUNTING AND FISHING CLUBS
  - R3 COTTAGES AND CAMPS
  - R4 GOLF COURSES
- PARKS
  - P1 STATE PARKS
  - P2 COUNTY PARKS
  - P3 TOWNSHIP PARKS
  - P4 CITY PARKS
- AGRICULTURE
  - A1 EXPERIMENTAL
  - A2 GRAZING TYPE
  - A3 DAIRY-WOODLOT TYPE
  - A4 DAIRY-HAY-POTATO TYPE
  - A5 DAIRY-POULTRY-FRUIT TYPE
  - A6 GARDEN-HOMES TYPE
- CITIES AND TOWNS
  - C1 INDUSTRIES
  - C2 BUSINESS AND RESIDENCE
  - C3 HEALTH HOMES
  - C4 AIRPORTS
- WATER POWER — FLOWAGE RIGHTS AND PLANT SITES

A. HOEN & CO. BALTIMORE.

MAP 39. LAND UTILIZATION PLAN FOR ALGER COUNTY, MICHIGAN

The present legislature (1931) is considering a forest taxation bill [5] that is intended to provide the desired tax reform. If it is enacted into a statute, we may assume that it would at least apply to those lands that are sufficiently well stocked with mature and second-growth forest to warrant their receiving the benefits of this Act. Such lands would then be made available for continuous forest use except where their character and environment might justify some other more promising use. The bill also proposes that the lands that receive the benefits of the Act shall be open to the public for hunting and fishing, thus guaranteeing their availability for these forms of recreation coincident with their forest use. These two uses, private forestry and the hunting-fishing type of recreation, are mutually supporting. The former, by keeping the areas clothed with forest cover, will help to maintain a suitable habitat for game and fish which will give value to isolated locations for cabin sites.

Study of the map of intent in ownership (Map 36) indicates that timber production is the most general and widespread intent in ownership. It quite completely covers the areas with mature forest growth (Map 35), occupies a considerable part of the second-growth forest area and even extends into the open wild lands, marshes and bogs. Reference to the natural-district map (Map 34) would seem to indicate that these owners are hopeful of keeping almost every kind of land in forest production except the sand dunes in the northeastern part of the county. A somewhat better definition of that intention is obtained, however, by referring also to the tax-delinquency map (Map 38). It reveals that their intention has been weakened by an accumulation of tax delinquency wherever Districts G (sandy pine plains) and H (swamp) of the natural-district map coincide with the open

[5] Editor's Note — Since the preparation of this paper the bill here referred to has been given legislative and executive approval. It is known as the Rushton-Coates Act, State of Michigan, 56th Legislature, Regular Session of 1931, Senate Enrolled Act No. 75, An act to amend sections two, four, seven, eight, nine, ten, thirteen, and thirteen–a of act number ninety-four of the public acts of nineteen hundred twenty-five, entitled "An act to provide for the establishment of commercial forest reserves and the administration and taxation of the same. . . ."

wild land and the marshes and bogs of the cover and land-use map. In fact, in these situations considerable areas have already reverted to state ownership and others are fast approaching it through accumulating delinquency. Closer attention shows that even in the areas of second-growth forest delinquency of one, two and three years is quite common. In those localities where such conditions of delinquency mesh in checkerboard fashion with neighboring blocks of mature forest — high assessed value — no delinquency, the effect of the so-called "cut-junk-jump policy," is plainly revealed, as, for instance, in T. 47 N., R. 17 W., and in T. 45 N., R. 22 W., where under recent and still active logging operations the cut-over lands have been allowed to go tax-delinquent as soon as the timber is removed.

Experimental. — The experimental forest of the Lakes States Forest Experiment Station is located in Marquette County on two half-section tracts that adjoin the west line of Alger County. The results of the investigations in forest management and forest economics that are being carried on here will be a guide to both public and private forestry in Alger County.

National forests. — The recently established Hiawatha National Forest extends into the south-central part of Alger County. The official boundaries of this national forest inclose a considerable area of second-growth forest and open wild land. Logging operators are actively engaged in cutting the remaining stands of mature forest from the private lands that have not yet been acquired by the Government.

This unit of the national forest contains a large number of lakes and streams which give it a high recreational value that will be maintained and enhanced by management of the area as a national forest. In the utilization plan the limits of the national forest have been extended beyond the present official boundaries to include a larger acreage of similar character.

State forests. — The Lake Superior State Forest, which joins the east side of Alger County, might well be extended westward to Grand Marais to include the eastern part of T. 49 N., R. 13 W., where cut-over land, open wild land, high delinquency and accumulating public ownership coincide. This area is a region of

sand dunes and sandy lake bed soils. The location and the character of the soils do not invite agricultural use or private forestry. The young forest growth that has been able to reëstablish itself on these sandy cut-over and burned-over lands is so scanty and of so inferior a quality that considerable forest planting will be required to obtain a satisfactory stand of forest growth.

Similar conditions prevail over an area of about thirty-six square miles in T. 48 and 49 N., R. 15 W. This area is locally known as "The White Rat Plains." Here fully one third of the land has already reverted to state ownership. This block of sandy, low-grade forest land might well be brought under management as an outlying part of some organized state forest. Like the area east of Grand Marais, it requires a large initial outlay to reëstablish a satisfactory forest cover and a long wait for returns on the investment, a condition that public forestation is better prepared to undertake than private forestry. .

Private forests. — The area selected for forests under private enterprise includes most of the remaining stands of mature forest. These timber stands of course cannot all be cut in the very near future; therefore the lands that they occupy will not soon become even potentially available for any other use. The associated areas of second-growth forest are mainly fair to good stands of young or advanced hardwood and swamp conifer growth. Open wild land, marshes, bogs and other low-grade forest growth are present throughout the mature and second-growth forest, but only on acreage so scattered and limited that it would normally be absorbed in the management of a considerable area for forest production. For forestry purposes the soils would class as fresh loams, sandy loams and loamy sands. The latter are level hardwood lands that experience has shown to be just too light to sustain northern Michigan agriculture. The others are stony, rolling and hilly or imperfectly drained, qualities which do not seriously affect their forest production, but which render them less suitable for agriculture.

The area selected for private forests embraces the land and forest conditions that prompted the Rushton-Coates Act.

WILD-LIFE PROPAGATION

Sanctuaries. — All the public parks of course automatically became wild-life sanctuaries in which hunting and trapping are prohibited except as human enjoyment of these areas may demand the elimination or curtailment of certain undesirable species by authorized officers or agencies.

The "sanctuary" nature of the large area of city park surrounding the city of Munising deserves some special mention. This area has cover, water and terrain that are well suited to habitation by deer, beaver, ruffed grouse and many other interesting animals and birds. Their abundant presence will prove to be an appealing attraction to tourists, summer visitors and permanent residents.

Refuge and public hunting ground. — A block of twenty-four square miles in the eastern part of T. 46 and 47 N., R. 17 W., has been assigned to this use. It is the western extension of the state's Cusino Deeryard Purchase Area. This area has been examined by the Game Division of the Department of Conservation and is classed as suitable for the purpose. The lands on which the greatest winter concentration of deer occurs are located partly in this tract, but mainly just to the east in Schoolcraft County. Most of the Alger County lands will go to make up the zone of public hunting ground that is to surround the central refuge area within which no public hunting or trapping will be allowed.

Fur farms. — The streams, marshes and small inland lakes offer many locations that are suitable for fur farms where beaver and muskrats can be raised in captivity for their pelts. One such farm has been located a few miles west of Munising in T. 47 N., R. 19 W., along Bay Furnace Creek. A prospective location is designated just northeast of Au Train Lake on the line between T. 46 and 47 N., R. 20 W. Close inspection of the detailed maps showing water features, forest growth and soil conditions will easily reveal a dozen or more equally suitable tracts.

Native beaver are becoming quite plentiful through the wilderness areas; if unmolested they do not seem averse to occupying locations with suitable water and food supplies, even within the

farming sections. In fact, a small colony is now established in the southeast part of the Agricultural Experiment Station Farm.

Game farms. — The owners of Grand Island have closed this area to public hunting and are giving attention to game propagation, notably deer and elk. This island constitutes a type of "game farm" on which the hunting privileges are commercialized by the owners in connection with their control of the recreational facilities.

RECREATION

Commercial resorts. — The only pretentious resort, other than the hotels at Munising and Grand Marais, where the public may obtain accommodations and enjoy the associated recreational facilities is located on Grand Island. The guests at the lodge on Grand Island have the privilege of enjoying the advantages and attractions of the entire island.

Hunting and fishing clubs. — Six hunting and fishing clubs have long been established in the county — Peter White Club, Deer Lake Club, Doe Lake Club, Cherokee Club, Newton Club and Birmingham Club — and nearly all of them own or have access to lands that provide special hunting and fishing privileges. The areas that have been assigned to this use cover the lands that are required for and are suited to the perpetuation of such privileges for the clubs.

At least as many more tracts suitable for club ownership, where lake and stream fishing are combined with good deer and grouse cover, are available within the areas set aside for national and private forests.

Cottages and camps. — The four areas assigned to cottages and camps were selected because they have already attracted a considerable amount of the summer-cottage type of recreational development. They all give access to fishing and bathing, have ample areas of unoccupied well-drained sandy land for additional cottage sites and sufficient second-growth forest for fair to good shade. Some of the cottages within these areas are also used by hunting parties during the open season for deer.

The symbols indicating summer cottages and hunting cabins

that are scattered through the lower-central and upper right-hand parts of the area shown on Map 33 are nearly all maintained for the combined purpose of outing, fishing and hunting. Very few of these control much more land than the small acreage or lot needed for the cabin site. Though this scattered type of individual recreational development usually does not build up high real estate values, like those of the more congested lake shore development, it does, however, bring a considerable volume of trade and business to the county. It seems likely that private, state and national forestry will encourage the further development of this type of use by preserving the fish and game habitat that it seeks and by keeping a large area of suitable territory open to public use.

Golf courses. — This type of use will occupy only very small areas, but it is important in order to provide a full program of recreational facilities. Two especially well-suited tracts are designated near the county's principal points of tourist concentration, one near Munising and another at Grand Marais, where the courses will be open to the permanent residents.

PARKS

State parks. — The most extensive state park area has been assigned to the "Pictured Rocks" shore line of Lake Superior which extends from Munising to Beaver Lake. This tremendous sweep of rock-bound shore line is one of Michigan's impressive landscape features. Miles of varicolored sandstone cliffs, with wave-worn caves at their bases, rise over one hundred feet above the lake's surface. The blue-green lake at their base and the forest-mantled crest above provide an unusual setting. Boats can make safe landings only on the short stretches of sand beach at the mouths of the rivers where the cliffs recede inland to wall the gorgelike valleys of streams. The landward boundary of the park area has been extended inland from the Superior shore along these river valleys for a sufficient distance above their mouths to include several beautiful cascades and a suitable forest setting that should be preserved in its undisturbed wilderness character.

The "Pictured Rocks" end about a mile northwest of Beaver

Lake, but the park area has been extended to give access to the safe anchorage at the outlet of Beaver Lake and to include the excellent bathing beach which extends along the northwest side of that inland body of water.

A second state park area has been outlined to cover the Grand Sable Banks that lie just west of Grand Marais. This is Lake Superior's most expansive shore area of barren traveling sand dunes, whose desert-like appearance is a unique landscape feature in Michigan. Here an interesting geological battle is being waged by the landward march of the dunes, which are burying the forest, encroaching on Grand Sable Lake and threatening to block the stream that flows from that lake to Lake Superior. If the dunes should close this stream its beautiful Sable Falls will be destroyed and Grand Sable Lake will be forced to seek an outlet by draining southwestward to the headwaters of the Hurricane River. Practically the entire area that would be covered by the Grand Sable Banks Park is already in public ownership. Only a relatively small additional acreage would need to be added to acquire camping sites and water frontage on Grand Sable Lake.

The eleven "forties" of state-owned land just north of Au Train Lake should be designated as a park area open to public use for camping. This tract is partly swamp and partly well-drained sandy upland. The upland portions give access to the river that flows out of Au Train Lake. They are forested sufficiently to provide shady camp sites. Recent expansion of the cottage type of recreational development in this vicinity is fast restricting the public's access to water frontage camp sites. Both the cottage owners and the camping tourists will be favored by reserving these state lands for a public camp site.

County parks. — Four small areas have been assigned to county parks. The proposed 320-acre park in T. 46 N., R. 22 W., is designed to preserve the falls of the Laughing Whitefish River. This beautiful falls is the outstanding scenic attraction in the western part of the county and has often been mentioned as a site for a state park. It lies but a short distance north of M–28 in the wooded rocky gorge of the Laughing Whitefish River.

The three other proposed county parks have been selected to

insure that the local residents shall have public privileges to water frontage for bathing and fishing in association with adjacent well-drained shady sites for picnic parties and camping.

The area just southwest of Munising is located on Perch Lake and will be used chiefly by the residents of this city and their summer visitors. It is their most convenient inland lake and is already reached directly by foot trail from the city or over a poor automobile road from the north. It can be made accessible for automobiles from M–28, which passes to the south of the lake, and could be the principal objective in a more extensive system of improved foot trails and bridle paths leading out from the city of Munising.

The area just south of the corner of T. 45 and 46 N., Rs. 20 and 21 W., would be used principally by the rural residents of the Chatham–Trenary communities. Highway M 28 borders its northern margin. It is an area of light sandy soil that is well wooded near the highway, but more sparsely forested in the southern part. The water-power development that is being installed on the Au Train River will provide a body of water for this park by its flowage area.

The small area in the extreme northwest corner of the county is located on the improved shore-line highway that extends from Munising to Marquette. It will be used by the local residents who live in both counties in the vicinity of this park. In addition, it will provide camping and water-front facilities for those who tour this way. The area outlined extends southward from the Lake Superior shore past Sand River to include Sand Lake, a small inland body of water with a sandy, shaded shore and a good bathing beach on its north side.

Township parks. The single area, Au Train Township Park, is already established. It is a rolling and hilly wooded area bordering the beautiful winding drive that leads from M 28 to Au Train Lake. It has no lake frontage, but includes a mile and a half of Au Train River.

City parks. — An area of about 4,500 acres, covering the forested hills and valleys that give the city of Munising its unusual and picturesque background, has been designated as a combined

city park and wild-life sanctuary. No other city in Michigan has a natural setting so strikingly beautiful. In the foreground the blue waters of Munising Bay lead to a vista over Lake Superior that is framed on the one hand by rugged verdant Grand Island and on the other by the Pictured Rocks shore line. The city itself nestles snugly at the foot of an imposing forest-clad slope that rises protectingly in the background and gives way only to let the crystal-clear Ann River reach the bay. This spring-fed stream and its tributaries come tumbling down from the still cool forest at the valley heads. Here trout and beaver find a congenial habitat, ruffed grouse drum in the autumn sunshine, and deer bound away into the sheltering forest when startled from their roadside grazing by passing automobiles.

This rugged green-clad landscape of hills and valleys and forest and lake has a cool and inviting aspect in summer. Fall paints it with colors that beggar description, and winter wraps it in a protecting mantle of sparkling white till spring brings an awakening to renew the parade of attractive and appealing seasonal changes. Forest and lake give the clean cool air a flavor that quickens health and ambition and makes of this locality an incomparable place to work and play.

Munising can well afford to preserve her unusual natural environs by providing them with park and sanctuary status and improving them for both summer and winter enjoyment by the many who are interested in nature, healthful recreation and sport. The crowded municipal tourist camp should be supplemented by developing a half-dozen or more smaller camping sites scattered in attractive and accessible locations within the area of the proposed city park. These might be connected with one another and with the city by a system of foot trails and bridle paths that would open the entire park to equestrians, hikers and nature lovers. Such development of her inherent natural advantages would give to Munising an attraction that could not be shared by any other lake state city.

AGRICULTURE

Reference to the map of intent in ownership (Map 36) reveals that agriculture is the intended use for considerable blocks of

land in the northern and eastern parts of natural District A, where high-lime productive loam soils predominate. The bulk of the county's agriculture has established itself in the vicinity of Chatham, Traunik and Trenary on these land conditions. Note how definitely the location of the existing farm development and the intention to farm coincide with the northern border of District A, where it joins on District C, the rolling, stony, sandy loam, hardwood uplands in the vicinity of Onota. Evidently District C is not considered potential farm land by either its present owners or by prospective farmers, since farming is the declared intention on only a few scattered parcels in this district.

Farming is, however, the declared intention in ownership for small areas near Munising, north of Shingleton and south of Grand Marais. The Munising area falls within Natural District D on rolling to hilly, light sandy loam uplands. This combination of natural characteristics covers a large part of the county, but it has been unable to attract farm development except to certain small areas that were sufficiently favored by location to offset their less suitable soil and topography. In this vicinity two small areas closely adjacent to Munising have been reserved for the garden-home type of agriculture, where the industrial employees of Munising may occupy two- to five-acre farms similar to those developed by the furniture-factory workers at Grand Rapids and the mine workers at Iron River. The more distant portion of the area tributary to Munising has been assigned to the prevailing dairy-hay-potato type of agriculture.

A considerable area north of Shingleton has natural conditions comparable to those of Natural District A. It has attracted a modest acreage of farm development, but ownership for that purpose has not extended much beyond the limits of the land now in farms because existing stands of mature forest growth, lack of roads and distance to a shipping and trading point restrict the availability of this area for agricultural use.

The area of farm development near Grand Marais is located almost entirely on the level, hardwood, loam lake benches that extend to the south and west of that village. Ownership with the intention of farming has spread somewhat beyond the limits

of present farm development. It is, however, apparently an over-optimistic intention, since the Grand Marais community can consume but a very small amount of farm produce and the surplus production must be trucked over twenty miles to the railroad station at Seney for shipment to distant outside markets. A diversified type of agriculture that emphasizes dairy products, poultry products, potatoes and fruit may be able to use the present acreage of cleared land, but there is apparently no evident need for its further expansion under the community's present economic environment.

The four southwestern townships, 44 and 45 N., Rs. 21 and 22 W., constitute an interesting problem. Map 32 shows rather generous transportation facilities already installed. Map 33 records a concentration of rural habitations that is exceeded only by the Chatham community in the adjoining townships to the north. Map 34 reveals Natural District A covering all of these four townships except the eastern margin, which is occupied by the western extension of District E (level, hardwood, loamy sand plains) and an arm of District H (swamp). Map 35 shows mature forest, second-growth forest and scattered farm land in the two western townships; and second-growth forest, farm land and open wild land in the two eastern townships. Map 36 indicates the intent in ownership to be timber, speculation, farming and public (state) ownership in the two western townships, whereas farming, speculation, timber and public (state) ownership, or the negative intention of farm abandonment, dominate the two eastern townships.

Map 37 gives high values on the mature forest, moderately high on the farm land and low on the land owned for speculation. Map 38 proves that delinquency is common on farming abandoned lands owned for speculation, open wild land and certain tracts of second-growth forest. The delinquency pattern alone, without further inquiry or understanding, leads to the inference that these four townships are headed toward timber depletion, further farm abandonment and state ownership. The dismal picture that the delinquency pattern predicts for them may develop. The only hope that it will not do so is found in the fact that the economic environment is seemingly out of adjustment with the natural

conditions and that it may possibly be brought into adjustment, so that these lands may profitably be devoted to timber growing and agriculture. This area of good land, suitable for farms or forests or a combination of farms and forests, is suffering from "idle land indigestion" induced by an annually increasing ration of idle land that has been fed into it by the trend of events and a too burdensome system of taxation. The owners of the mature forest on the western side of the area have been dumping their clean-cut lands into delinquency under the "cut-junk-jump" policy, and a land settlement company owning a large acreage of cut and burned wild land through the eastern part has been forced to discard its equities to delinquency by the shrinking market for raw farm land. Ground between these two millstones of delinquency, the farmers of the central section have added their bit to the annually growing list of delinquent lands. Meanwhile, the fire-cleared wild lands and the abandoned farms grow grass that is ungrazed and the cut-over lands restock themselves to second-growth forest in which no profit in ownership can now be seen. And probably none will be visible until the warmth of a more equitable system of taxation dissipates the cloud that is casting the growing shadow of delinquency over this area.

The Upper Peninsula Agriculture Experiment Station at Chatham is near at hand. The results of its experimentation in soil management, crop adaptation and animal husbandry are available and indicate that the well-drained upland loam soils that prevail in these townships are suitable for agricultural use. Under a favorable economic environment this type of use should be able to occupy permanently a considerably larger acreage than at present.

The central portion has natural characteristics that adapt it to the common dairy-potato-hay type of farming that now prevails on the existing farms. The fire-cleared lands on the eastern margin invite a grazing type of livestock farming with larger units of ownership, a minimum of plow land and correspondingly lower acreage values. This type of use could give the neighboring farms of the central portion an adjacent market for hay, grain, roots, etc., to winter-feed the range stock. The

dairy type of farming has already shown an inclination to move into the western part of the area, as evidenced by the scattered farm development now established on rather recently cut-over lands. Here farming and forestry might be combined to afford year-around employment on farm-forest units of ownership that included plowland, pasture and forest growth.

CITIES AND TOWNS

Munising and Grand Marais are the only locations whose future growth may need to be guided to insure the highest functional use of the areas available.

Industries. — In the case of both of these towns the low, sandy, level bench bordering the bay should be divided so that industries may occupy the eastern and northeastern parts and that the western part may be given over to business and residence.

Health homes. — At Munising three areas on the crest of the high wooded bluffs that overlook the city and the bay have been reserved for health home sites. Here, rather large tree-covered lots and shaded winding drives would offer their appeal to those summer residents who are seeking healthful outdoor surroundings and easy access to neighboring lakes and streams, without losing the advantages that would be offered by the adjoining city.

At Grand Marais a single smaller area, which also overlooks the village and the harbor from the crest of the second lake bench, has been reserved for a similar use.

Airports. — Munising already has located its airport in the southeastern part of T. 46 N., R. 19 W., at a distance of about four miles from the city and about one mile south of the Duluth, South Shore and Atlantic Railroad station of Wetmore. The highway leading south from Wetmore runs along the east side of the landing field and the Lake Superior and Ispheming Railroad passes close to its south end.

The site chosen is excellent in many respects. It is located on the northern margin of an expansive plain where the landing field is easily found by approaching aircraft. Its sandy soil drains rapidly and thoroughly. Its distance from the city and its elevation above the lake place the landing field beyond the smoke zone

and above the reach of low-hanging lake fogs. The airport should, however, be extended to include at least the half-section of land outlined, so that the standard number of runways could be added while this acreage may still be cheaply acquired.

WATER POWER

Flowage rights and plant sites. — There are three sites capable of developing a marketable amount of water power: Au Train Falls, Miner's Falls and a place on the Sucker River southeast of Grand Marais. The lands that would be required for flowage rights and plant sites for each of these power projects are reserved for that use.

The Au Train and Miner's Falls projects are conveniently located for consumption of their power at Munising and by the several farming communities and their associated villages, or their energy could be diverted into a trunk-line hook-up with other north shore projects.

The Sucker River project has not yet been fully appraised by the Land Economic Survey. When electric power is needed at Grand Marais this project may be capable of meeting the demand.

CONCLUSION

The foregoing assignment of particular uses to definite land areas has been rested on the major differences of character and environment that the several land areas possess. The assigned uses are, therefore, simply a guide to point out the type of use that will be in closest harmony with the dominant nature of the areas. Greater refinement can and probably should be made, or at at least allowed, in the application of the utilization plan to permit the adoption of some use other than the assigned one, for those local areas that possess a character or an environment different from that of the larger area for which the assigned use was selected.

Further still, it would probably be inadvisable to employ the utilization plan as a basis for enforcing the assigned uses, or for excluding other uses, as is customarily done with city plans when zoning ordinances are adopted to enforce adherence to the plan.

The thought is rather that this, or any, utilization plan will derive its effective momentum from its obvious soundness. Sound and acceptable plans can be expected only if the inventory has been adequate and accurate, if the facts found by the inventory have been impartially appraised and intelligently used, and if the composers of the plan have been sufficiently qualified in experience and judgment.

Poorly conceived and unsound plans probably cannot, and certainly should not, be enforced. A well-conceived utilization plan ought to carry itself into effect with only such encouragement and support as public agencies and public officials may be able to accord it by adopting policies and providing facilities that will assist the establishment of the assigned uses. In order that the final plan may merit such encouragement and support, the preliminary draft should be reviewed and criticized by the public agencies and officials most directly interested or concerned in the application of the assigned uses. In particular, the State Agricultural College and Agricultural Experiment Station, the University of Michigan, the Department of Conservation and other state departments, the U. S. Forest Service and its Forest Experiment Station, the U. S. Department of Agriculture and the Institute for Research in Land Economics and Public Utilities should lend their facilities and the benefit of their council in shaping the plan into its final form. Among others, the county officers and the county board of supervisors can, no doubt, lend material strength and effect to the utilization plan out of their experience and intimate acquaintance with local land affairs.

State Department of Conservation
Lansing, Michigan

GLACIAL GEOLOGY OF IRON COUNTY, MICHIGAN

STANARD G. BERGQUIST

THE field work in Iron County was conducted during the summer of 1930 in connection with the program of the Land Economic Survey. Iron County lies within the area of the Superior Highland in the western portion of the Northern Peninsula. The bedrock is associated with the pre-Cambrian complex and is quite generally buried under a mantle of glacial drift with varying thickness up to 300 feet. The general broad features of the county are preglacial in origin and, according to Smyth,[1] represent a surface which was reduced to the condition of an approximate peneplain before glacial times.

During the Pleistocene epoch this region was overridden with a vast sheet of ice which moved down through the Superior basin from the Labrador center in eastern Canada. As the ice melted in retreat, it laid down the deposits which now give expression to the surface. The glacial features, which make up the relief of the area, are the results of deposition from two distinct ice lobes which occupied the region at different intervals during the late Wisconsin stage. (See Map 40.)

THE TILL PLAIN OF THE CHIPPEWA LOBE

The topography associated with the earlier of these two lobes is centered in the rather extensive till plain which forms the southern portion of the county, extending from Crystal Falls westward and lying to the south of the Paint River. This plain is characterized by broad uplands that stand at an elevation ranging from 1,400 to 1,800 feet (Pl. XXIV, Fig. 1). The surface is fairly rough and irregular and, where the drift cover is thin, it is

[1] Smyth, H. L., *The Crystal Falls Iron Bearing District of Michigan, U. S. Geol. Surv., Monograph 36*, Part II, p. 331. 1899.

controlled to a large extent by the topography of the underlying rock (Pl. XXIV, Fig. 2). The highest elevation in the plain is Sheridan Hill, a till-veneered monadnock which rises to a height of 1,840 feet, or practically 240 feet above the general level of the surrounding plain (Pl. XXIV, Fig. 3). This is likewise the highest point in the county.

In the region extending from Crystal Falls and westward to beyond the limits of Iron River the topography is definitely ridged (Pl. XXV, Fig. 1). Drumlins and drumlinoid hills trending parallel and in a direction S. 20° W. feature the landscape (Pl. XXV, Fig. 2). The smoothly rounded ridges (Pl. XXV, Fig. 3) are separated by sags and basins which hold the numerous swamps, lakes and minor drainage ways.

The glacial drift which comprises the till plain is sandy to clayey in texture and contains a great number of erratics and large boulders which were drifted down from the north. Much local material from the iron formation is incorporated in the drift. The soil varies in color from light to reddish brown and shows but slight variation throughout the extent of the plain.

In the southwest corner of the county the relief is somewhat more subdued. Ridges give way to a topography which is more or less undulating. The drift in several of the townships in the vicinity of Elmwood in this district is composed of stratified material with heterogeneous associations of clayey till and numerous erratics as large as six feet. These boulders are not scattered over the surface alone, but are intermixed with the sandy, gravelly material, even at depth.

The drift of the till plain may be attributed to an ice movement which was much more extensive and definitely earlier than that of the Superior lobe. It is associated with the Chippewa-Keweenaw ice tongues which were directed in their movement largely by the Keweenaw Peninsula. The Chippewa lobe was induced by the broad embayment west of the peninsula, whereas the Keweenaw sheet found its way through the narrow bay to the east. The Chippewa was much the larger of the two lobes and in its maximum extension reached some distance south into Wisconsin, where it lay to the west of the Green Bay lobe. The Keweenaw

MICHIGAN
DEPARTMENT OF CONSERVATION
LAND ECONOMIC AND GEOLOGICAL SURVEYS
COOPERATING
GEOLOGICAL MAP
SHOWING
SURFACE FORMATIONS
OF
IRON COUNTY
R37W
HOUGHTON
R36W
COUNTY
R35W
R34W
BARAGA
R33W
T46N
T45N
T44N
T43N
GOGEBIC
KEY TO MAP
SURFACE FORMATIONS
MORAINES
TILL PLAINS
OUTWASH PLAINS
AREAS OF BEDROCK OR THIN GLACIAL DRIFT
ESKERS
SWAMPS
DRUMLINS
CITIES
VILLAGES
RAILROADS
ROADS
TRAILS
ELEVATIONS BAROMETRIC

Map 40

ice-mass did not extend as a definite lobe very far beyond the limits of the present Lake Superior basin, but soon merged with the rapidly expanding Chippewa ice-sheet.

Russell [2] refers to this extensive plain as having a topography which is distinctly morainic. He also separates the drift into an older red till east of the Chicaugon—Trout Lake depression and a younger overlying gray till to the west of the slough.

Allen [3] likewise recognizes the presence of two drifts, the red and the gray, but emphasizes the fact that there is no great amount of distinction between the two types and that their separation would be extremely difficult.

Russell's interpretation of the topography in this plain was incorrect, for it is obvious that the ridgelike character of the surface and its drumlin associations would indicate deposition by moving ice rather than marginal deposition at definite stationary stages in ice retreat.

The general alignment of the ridges and valleys in the plain, together with the direction of the striae in the bedrock, would indicate that the ice in this lobe moved from the northeast and with a trend about S. 20° W.

A study of the soil in the till plain does not bring out any conclusive evidence that two different drifts are present. On the basis of color it is impossible to make any definite separation into red and gray drift. It is true that some local color variations do exist, but these are due mainly to the nature of the incorporated material rather than to a difference in age. In general, the till exhibits a fairly regular color throughout the plain and the soil has developed a profile which is consistently uniform.

GLACIAL FEATURES ASSOCIATED WITH THE SUPERIOR LOBE

Moraines

The moraine, which lies to the north of the till plain just referred to, is a terminal feature and was deposited at the margin

[2] Russell, I. C., *The Surface Geology of Portions of Menominee, Dickinson and Iron Counties, Michigan, Annual Report of the State Board of Geological Survey for the Year 1906*, pp. 40–52.

[3] Allen, R. C., *The Iron River Iron-Bearing District of Michigan, Mich. Geol. and Biol. Surv.*, Publ. 3, Ser. 2, pp. 15–22. 1910.

of the Superior lobe. This moraine is the eastward continuation of a well-defined system which extends from the western end of the Lake Superior basin and follows a general easterly course into Iron County. In the northwest corner of the county it separates into two limbs, the outer one of which may be traced along the north edge of the county eastwardly to R. 34 W. Here it turns abruptly to the southeast and continues into the vicinity of Crystal Falls. To the east of this village the moraine is quite largely buried under glacio-fluvial material and only the higher portions protrude.

The drift in the western portion of this moraine in Iron County contains considerable quantities of rock material which was drifted eastward from the Gogebic Range. There is a suggestion that the ice in this section moved slightly south of east. In the region of Perch Lake and southward glacial striae in the rock floor indicate that the movement of the ice-sheet was about S. 6° W.

The moraine stands as a rolling mass of till and is not clearly separable into distinct ridges. The relief is gently undulating to rugged, with elevations ranging from 1,400 to 1,700 feet (Pl. XXVI, Fig. 1). The drift is reddish to brownish, except in the region between Perch Lake and Net River, where it is quite distinctly of a grayish cast. The gray color of the soil in this area is due in large measure to the incorporation of material derived from the local rock, which consists principally of gray quartzitic slate and graywacke. In the vicinity of Perch Lake the moraine is made up of a series of more or less rounded knobs set in an otherwise fairly level plain (Pl. XXVI, Fig. 2).

The inner limb of the terminal moraine swings to the northeast across the south end of Houghton and Baraga counties, thence to the northeast corner of the county. A narrow strip of outwash situated in the southern portion of Houghton and Baraga counties separates the two limbs of the moraine for much of the distance. A small till plain lies between them in the northeast portion of the county. At this point the moraine turns south and follows along the east county line past Sagola in Dickinson County (Pl. XXVI, Fig. 3).

The drift in this portion of the moraine, especially along the

line to the east of Crystal Falls, contains considerable quantities of dolomite, apparently of the Hermansville formation. The presence of this rock in the drift, together with the striae in the glacial pavement in the southeast portion of the county, would suggest an almost due westward movement of the Superior ice-sheet in this region.

Till plain

The small till plain which lies in the northeast portion of the county is characterized by a smooth to gently undulating surface. The drift is similar to that which is found in the adjoining moraine. It is brownish and is composed of intermixtures of sandy and clayey soils. Erratics and large boulders are strewn extensively over the surface and likewise generally incorporated with the drift.

Glacio-fluvial deposits

The glacio-fluvial deposits are confined principally to the major streams of the county. The valleys of the Paint, Iron, Deer, Fence and Michigamme rivers serve to illustrate the disposition of these features. They were formed, apparently, during the stage when the ice was receding northward by melting. Fast-flowing melt waters draining into the preglacial valleys served to scour out part of the glacial débris which had been left in the wake of the receding ice-sheet. The coarser materials, such as boulders, erratics and large cobbles, were not carried away by the water, but were concentrated by the removal of the finer till. These remnant boulders may now be observed along the older valley slopes and at the base of the gravel deposits where excavations have been made.

The gravel and sand which make up the bulk of the material in the deposits were no doubt carried in by rapidly flowing, sediment-choked waters issuing from the receding ice border. The preglacial valleys, which received these waters, were partly, but not completely, filled with coarse material, owing to the fact that the ice margin was receding quite rapidly. When the ice-sheet had retreated sufficiently far to the north to diminish the

supply of sediments for the valleys, depositional activity was materially diminished and erosional work initiated. During post-glacial times the rivers have continued to scour out the sediment and to sink their channels deeper into the deposits. Till the present, however, the streams have not cut through the material to encounter bedrock, except in very few places where the glacio-fluvial deposits were originally exceedingly thin (Pl. XXVII, Fig. 1).

In a deep cave near Caspian the stratified sand and gravel attain a thickness of 118 feet and rest directly on the bedrock of the iron formation. Large glacial boulders mark a somewhat definite contact between the rock ledge and the base of the deposit (Pl. XXVII, Fig. 2).

In many of the glacio-fluvial areas there is to be found on the surface of the gravel a layer of light brown, fine silt ranging in thickness from merely a few inches to six and more feet. It has developed a distinct profile and in the thicker portions is definitely weathered to depths of three to four feet below the surface. This fine material was carried down into the valleys by the slowly moving waters toward the close of the period when the glacier was contributing only the finer sediment. It represents the waning stages in glacial stream deposition. Much of the material is found some distance from the valleys of the present rivers and there is a slight suggestion that it may have been carried out from the valley ways by the wind. It would not be difficult to have loessial deposits developed under circumstances such as are found in these localities.

The general distribution of the gravel and sand in the main preglacial valleys of the county suggests the possibility that the term "valley train" might be correctly applied to cover the deposits. They are not typically of the outwash plain type and seem to bear little or no definite relationship to the moraines, as in the case of the true outwash (Pl. XXVII, Fig. 3).

In the region of Crystal Falls the gravel plain covers a quite extensive area. This material was undoubtedly carried down by the glacial waters which occupied the valley of the Paint River and was spread out over the older morainic surface when drainage

to the south was cut off. Leverett [4] suggests that the outwash did not continue down the Menominee River because the ice of the Green Bay lobe was at the time covering up that valley nearly to the mouth of the Paint River.

DRAINAGE

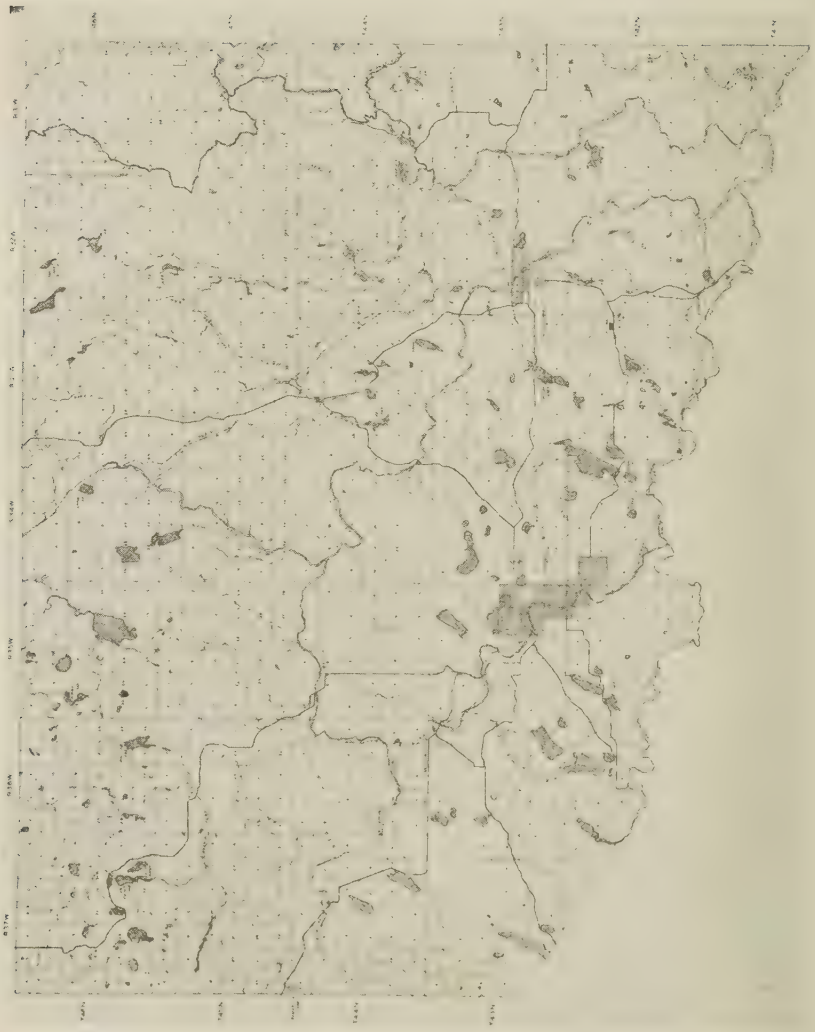
The minor drainage lines of the county are largely controlled by the relief of the surface. In the till plain which lies to the south of the Paint River the smaller streams occupy the sags between the drumlins and the drumlinoid ridges and follow courses which parallel the trends of the hills. The majority of the lakes in this area lie in similar topographic positions and are elongated in a direction parallel to that of movement of the ice. Smoky, Pickerel, Stanley, Iron, Chicaugon, Trout and Fortune are among the larger ones which exhibit this relationship. (See drainage map, Map 41.)

The major drainage bears no relationship to the natural northeast-southwest topographic trends. Many of the larger streams, the Brule, Iron and Paint rivers, cut diagonally across the glacial ridges. In all probability many of the major rivers follow modified preglacial drainage courses for considerable portions of their distances (Pl. XXVIII, Fig. 1).

The Painted River

The western and northwestern portions of the county are drained by the Paint River and its tributaries, the Net and the Hemlock. The Paint River has its headwaters in the western portion of the county and follows a broadly curving course just outside the limits of the drift of the Superior lobe. The river rises in a series of glacial lakes at an altitude of 1,600 feet and flows through an area of relatively thick drift to the vicinity of Crystal Falls. Below Crystal Falls rock outcrops are prominent and the river in places narrows down considerably as it rushes through the gorges cut in the resistant rock masses (Pl. XXVIII, Fig. 2). The Paint flows in an expanded valley into the Brule in Section 12,

[4] Leverett, Frank, *Moraines and Shore Lines of the Lake Superior Region, U. S. Geol. Surv., Prof. Paper 154–A*, p. 22. 1929.



MAP 41. Drainage lines of Iron County

T. 41 N., R. 31 W. at an elevation slightly below 1,200 feet (Pl. XXVIII, Fig. 3).

The Michigamme River

The Michigamme River, with its tributaries, the Deer and Fence, drains the eastern portion of the county. The drainage area of this system falls well within region of drift developed in the Superior lobe of the ice-sheet. The river heads in Lake Michigamme in Marquette County just a few miles to the east of the northeast corner of Iron County. It enters Iron County in Section 25, T. 44 N., R. 31 W., and flows in a southerly course through a region in which the glacial drift is relatively thin and rock exposures are numerous (Pl. XXIX, Fig. 1). Near its mouth the rivers plunges over a resistant mass of quartzitic rock in a series of falls about twenty-five feet high (Pl. XXIX, Fig. 2). The Michigamme flows into the Brule in Section 16, T. 41 N., R. 31 W., to form the Menominee River.

The Brule River

The Brule River flows along the southern part of the county and forms the natural boundary between Michigan and Wisconsin. The entire drainage basin of the river in Iron County lies outside the limits of the Superior lobe. In much of its course the Brule River occupies a preglacial valley which has been modified by glacial deposition and it follows successively through areas of till, glacio-fluvial material and rock outcrops. In the southeast portion of the county the Brule and Michigamme rivers join to form the Menominee, which continues as the state boundary southward (Pl. XXIX, Fig. 3).

Iron River

Iron River has its headwaters in a fairly level gravel plain immediately south of Beechwood in T. 43 N., R. 36 W. It follows a course which is generally south and empties into the Brule in Section 28, T. 42 N., R. 34 W. Its valley carries considerable areas of glacio-fluvial sand and gravel, and in the vicinity of Iron River cuts through the iron formation to expose ledges of massive rock.

Lakes

Numerous lakes, most of them relatively small, are scattered through the county. They reflect a glacial origin and lie mostly within areas of moraines, till plains and glacio-fluvial plains. Those which have developed in the moraines are of the morainic or kettle type (Pl. XXX, Fig. 1). They occupy depressions and are set in between the knolls of the more rugged areas, where they are generally bordered by upland slopes (Pl. XXX, Fig. 2).

Lakes which occupy the glacio-fluvial plains are referred to as "pit lakes." They are generally bordered by level tracts of sandy material and are usually not so deeply depressed below the surface as are the basins in the moraines.

Many of the lakes are merely remnants of larger lakes which are gradually filling in with silt and organic remains (Pl. XXX, Fig. 3). These have developed swampy and marshy borders so characteristic of decadent types. The present lakes have been lowered appreciably in level since glacial times, as is evidenced by the position of their drainage outlets.

In general, it may be said that the drainage conditions in Iron County are quite youthful. The numerous lakes and swamps and the general haphazard drainage are evidences of this fact. The majority of the rivers have not yet cut through to bedrock; they are still excavating their channels in glacial drift. Further adjustments and changes will continue to take place as time progresses.

Michigan State College
East Lansing, Michigan

FIG. 1. Till plain two miles west of Crystal Falls

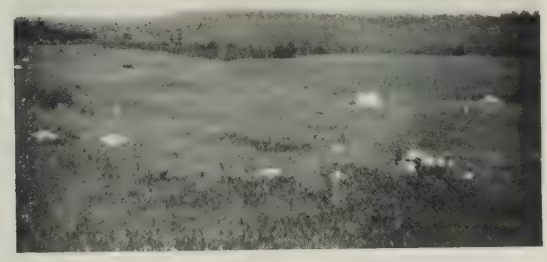


FIG. 2. Bouldery till plain, Section 2, T. 43 N., R. 33 W.

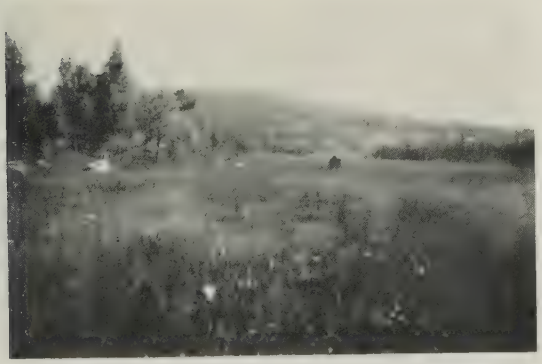


FIG. 3. Sheridan Hill, a till-veneered monadnock, Section 20, T. 42 N., R. 35 W.

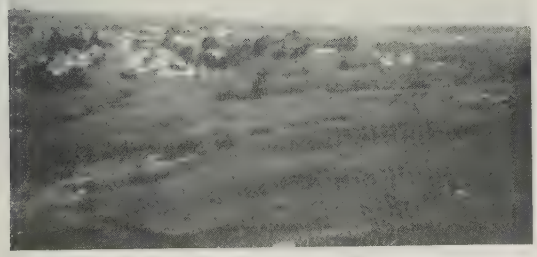


FIG. 1. Till-plain topography, Iron River

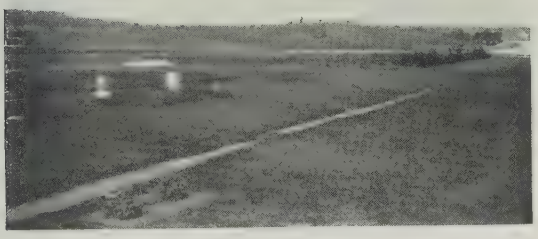


FIG. 2. Drumlin topography, one and one-half miles west of Iron River

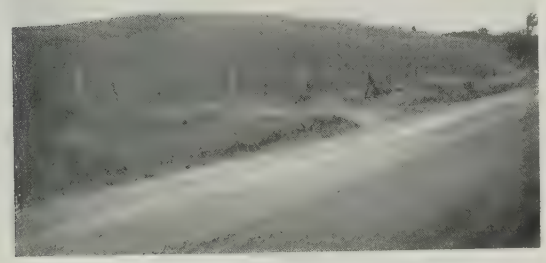


FIG. 3. Characteristic drumlin near Iron River

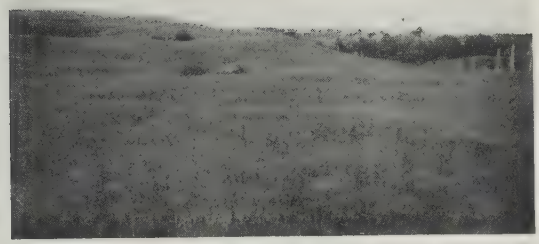


FIG. 1. Morainic topography near Amasa

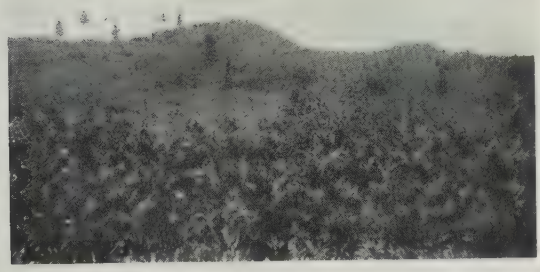


FIG. 2. Morainic hills, the Perch Lake area

FIG. 3. Morainic topography, east side of the county, Section 36, T. 43 N., R. 31 W.

FIG. 1. Gravelly plain near Beechwood

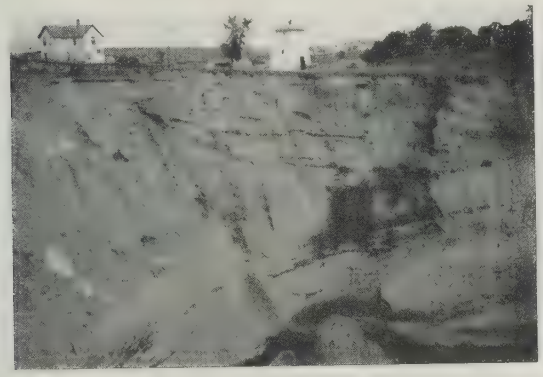


FIG. 2. Cave showing gravel deposit resting on bedrock, near Caspian

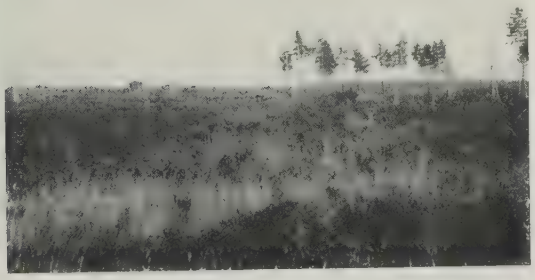


FIG. 3. Glacio-fluvial plain in the valley of the Paint River, Section 25, T. 42 N., R. 32 W.

PLATE XXVIII

FIG. 1. Paint River above Horse Race Rapids

FIG. 2. Horse Race Rapids on the Paint River, Section 35, T. 42 N., R. 32 W.

FIG. 3. Paint River near the junction with the Brule

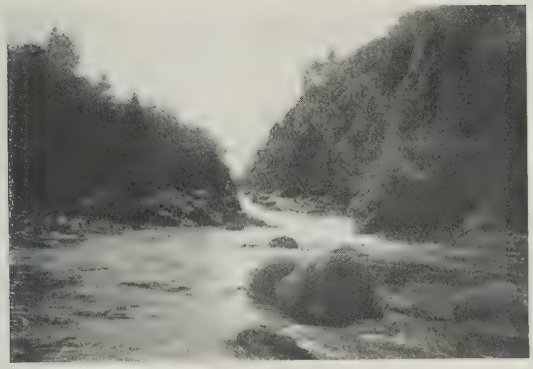


FIG. 1. Michigamme River near Mansfield

FIG. 2. Falls on the Michigamme River near the junction with the Menominee

FIG. 3. Brule River below the Brule Island Power Plant, Section 17, T. 41 N., R. 31 W.

FIG. 1. Perch Lake showing glacial pavement near shore

FIG. 2. Swan Lake, in till plain,
Section 2, T. 43 N., R. 33 W.

FIG. 3. A pit lake, in glacio-fluvial plain,
Section 27, T. 44 N., R. 32 W.

CONCERNING A GRANITE PEBBLE INCLUDED IN A VARVED PRE-CAMBRIAN SEDIMENT

EDWARD MORRIS BRIGHAM, SR.

THE specimen shown in Plate XXXI, with both sides represented, is a large pebble of solidified sediment which contains bedded in its substance a smaller pebble of granite. It was found in a stony field in Calhoun County, Michigan, three miles east of Battle Creek. The land surface there is known to be made of rock débris transported by the last sheet of ice which overspread the region during the latest period of glaciation affecting the continent. The specimen is hardly three inches in length. It is chiefly composed of a fine-grained matrix in which is set a conspicuous, rounded, crystalline pebble, whose longer diameter is about one inch. The banded appearance is due to successive layers of alternate seasonal deposits. Each contiguous pair of bands thus represents the product of a year of sedimentation. The record of such an annual cycle of deposition is called a "varve" by Swedish geologists, who have given particular attention to such structures.

Study of the relations of the component parts of the stone developed some interesting questions concerning its place of origin and its history. In the course of my investigations I sent it to Dr. Chester A. Reeds, geologist of the American Museum of Natural History, who determined its varved structure and its pre-Cambrian age. He also made suggestions concerning its origin and mode of deposition. In an effort to refer the larger pebble and its inclosed smaller one definitely to their parent formations, the specimen was submitted to several Canadian geologists, for it was believed to have come from within the range of their survey. Professor T. T. Quirke, of the University of Illinois, who had been

working for the Canadian Geological Survey in the district north of Lake Huron, said he could duplicate the specimen in the Cobalt region of Canada. Director W. H. Collins, of the Canadian Survey, declared he could match the specimen in his collections and was of the opinion that it came from the Cobalt region. Professor A. P. Coleman, of the University of Toronto, thought the included granite pebble very closely resembled the Algoman red granite of Canada. Professor Coleman is the geologist who in 1908 found in the Cobalt district conclusive evidence of a Lower Huronian period of glaciation.

The specimen is composed of clastic material in sharply marked zones and contrasting colors. Red argillaceous sediments alternate with gray arenaceous ones. The red zones are quite homogeneous and uniform in texture and are entirely without megascopic inclusions. Their color suggests that they may have been derived from the source of the red granite pebble. The arenaceous zones are thicker and are composed of numerous thin laminae. They are much specked by minute, angular, unassorted inclusions, most of which suggest by their color and form that they also may have been broken from the same parent red granite.

The form of the large included pebble indicates its glacial origin. In Figure 3, of Plate XXXI, there is shown the characteristic subangular form of glacial pebbles in contrast with the more rounded forms of water-worn pebbles. The coarse, angular inclusions scattered through the mud zones also indicate a glacial origin. Indeed there is no doubt among the authorities who have examined the specimen, that the whole structure is composed of glacial débris. Moreover, it is concluded that the thicker, gray, laminated zones represent the deposits of the summers, the seasons of special ablation, and that the red, argillaceous zones are the winter deposits. It is concluded, further, that the deposits were made in an inland fresh-water lake, since in salt waters flocculation would prevent such distinct laminations. Concerning the seasonal conditions of glaciers which induce variety and grading of rock waste, I quote Chamberlin and Salisbury:[1]

[1] Chamberlin, Thos. C., and Salisbury, Rollin D., *Geology* (*American Science Series*), 1: 320–321. 1906.

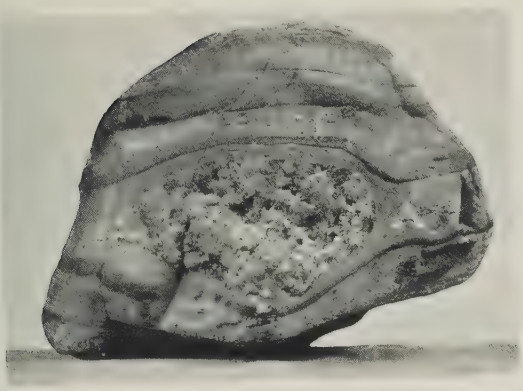


FIG. 1. A Pleistocene varved glacial pebble representing five years' deposits and composed of clastic sediments, which are of glacial origin in a lower Huronian period of glaciation. The laminae are distorted by the inclusion of a granite pebble. The alternating lighter and darker zones indicate summer and winter deposits

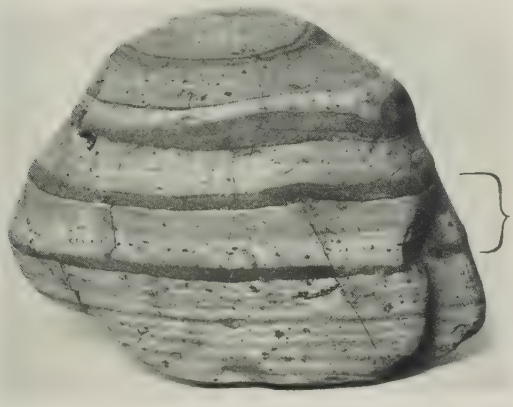


FIG. 2. The opposite side of Figure 1. Only nine seasonal zones shown, but remnant of tenth appears in upper view. The summer zone, including the pebble shown in the upper view, is indicated by the brace

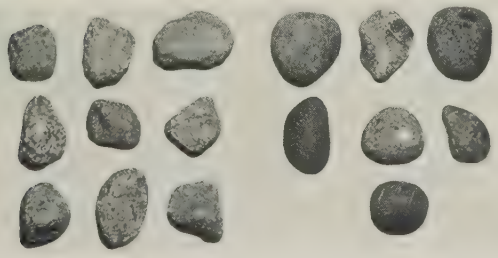


FIG. 3. The group of nine pebbles to the left illustrates the characteristic forms produced by glacial action; the group of six to the right, those produced by water action

"Stones in the base of a glacier may be held with great rigidity when the ice is cold and dry (as in winter), scoring the bottom with much force, while they may be rotated with relative ease when the ice is wet (as in summer). . . . a glacier should be more rigid in winter than in summer, and the whole thickness of the glacier should experience this rigidity chiefly at the ends and edges, where the relative thinness of the ice permits the low temperatures to reach its bottom." Hence, although the motions of the ice during the winter are slight, the rock grist of the glacier is developed chiefly during that season, with active corrasion confined largely to the heavy scoring on bedrock by stones held rigidly in the base of the glacier. The alternating zones of red and gray clastic material in this specimen are believed to represent this product, which was set free only during the summer, when the temperature was sufficiently high to loosen it and when the water of the subglacial streams under hydrostatic pressure carried it to the lake. The coarser materials of the gray summer layer were spread filmlike over the bottom of the lake as they were added from day to day. The finer, clay particles constituting the red winter layers were, however, kept in suspension during the summer season by the agitation of the lake water by the currents of the subglacial streams and by the slowness with which the clay particles settled. During the winter months, when the lake waters became relatively quiet, the clay particles settled gently to the bottom to form the winter layer, composed almost entirely of pure red clay derived by the ice from the red Algoman granite.

One eminent geologist inclines to the opinion that the included pebble was rolled out on the muds by a subglacial stream, but there are some reasons for hesitancy in accepting this view. First, it is doubtful whether the pebble could have been rolled on a bed of such soft, depositing mud. The diagram in text Figure 7 shows a similar inclusion in the same sort of matrix, figured by Director Collins of the Canadian Survey, who believes that this pebble was dropped with such force as to punch through several of the laminae. Though the pebble we are discussing did not rupture the underlying laminae, several of the overlying laminae

which were deposited later have settled over and about it. To be sure, if it is assumed that it was physically possible for the pebble to be rolled into that position, it is quite conceivable that its resistance to currents would cause a rocking or vibratory action, under the impact of the waters, that would cause it to settle deeper into the underlying deposits. Another consideration favoring the idea of dropping is that, according to the experiments

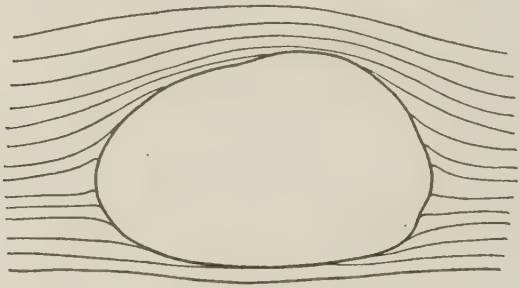


Fig. 7. Diagram showing how the weight of a glacial pebble dropped from floating ice into fine sediments enabled it to cut through several laminae (after W. H. Collins, *Canada: Geol. Surv., Memoir 143, No. 124, Geological Series*, p. 66.

of Sorby[2] and Forbes,[3] a current that would roll the granite pebble would have a degrading velocity not only on the mud but upon the megascopic inclusions common in the mud. Sorby found the current velocity required to start movement of a pebble the size of a pigeon's egg to be 1.45 meters per second. Forbes determined the velocity for movement of fine particles of fresh-water sand to be only 0.213 meter per second. From these demonstrations it is clear that a velocity of current that would move the pebble would energetically elevate and carry on the finer waste on which it was lying. Furthermore, on the same plane of deposits on which the large pebble rests there are numerous angular fragments of granite,

[2] Sorby, H. C. "On the Application of Quantitative Methods to the Study of the Structure and History of Rocks," *Quart. Journ. Geol. Soc. of London*, 64 : 171–233. 1908.

[3] *Proc. Royal Soc. of Edinburgh*, 3 : 474–476. 1856–57.

none of which much exceeds a millimeter in diameter. A current that could roll the large pebble would certainly have moved these finer fragments forward before they would come to rest.

The remarkably sharp lines of separation between the seasonal deposits appear to indicate an abrupt change of temperature, at least in the glacial ice, from season to season, and a consequent change in mode of deposition of the material. There appears no transitional mingling of the two kinds of sediments. This abruptness may be due to a sudden checking of ablation by winter temperatures which stopped the influx of the summer débris, and perhaps to an equally quick release in the warmer season. As suggested by the statement of Chamberlain and Salisbury already quoted, the general surface, the borders and the end of the glacier would be rendered rigid by extremely low winter temperatures and hence for the season would not be contributory to the discharge of débris. Accordingly, during winters subglacial scourings by ice rigidly holding stones would not be delivered to the lake. The winter deposits constitute but about 20 per cent of the volume of the specimen under discussion. They represent the settlement during the winter of the fine clay particles held in suspension in the preceding summer's influx.

We may assume, of course, that ablation is controlled by weather and that the thickness and varying physical aspects of the laminae from year to year are chiefly caused by fluctuations in ablation. Accordingly, the variation in quantity of the megascopic particles in the summer series appears to reflect special weather phases that condition excessive ablation, calving and flotation. The pebble was dropped nearly in the middle of the summer series of laminate deposits during the height of the season, when there was perhaps a maximum of calving and detachment of floating bodies of ice. It is noticeable that there was little of the coarser fragmental débris scattered over the lake bottom during the remainder of the summer. Thereafter, to the end of that summer, ablation appears to have waned, and we find no signs of the drizzle of the sharp bits of granite prevalent during the earlier half of the season.

During this Lower Huronian period of glaciation in the North

American region under consideration the climate appears to have been marked by strongly contrasting seasons in respect to temperatures, possibly much more than in the same latitude today. There are suggestions also of a somewhat more abrupt beginning and ending of the seasons. The large numbers of distinct summer laminae must be interpreted as showing constantly variable weather conditions during the summer, if we assume that their thickness and texture indicate fluctuations in volume of ablation.

An occasional lamina of unusual thickness, bearing signs in its megascopic inclusions of having its substance drawn from an exceptionally wide area, suggests a period of abnormal surface melting due to unusual warmth.

The pebble shows ten zones, alternating red and gray. Hence there are five pairs, or "varves," representing the summer and winter deposits of five years.

Varved pebbles, and even boulders of large size, which are essentially like this pebble in both their general composition and megascopic inclusions, abound in the vicinity of Battle Creek. Their number appears to indicate that vast volumes of such rocks were destroyed by glaciation in Canada, especially when it is considered that such sediments are easily wasted by attrition. Accordingly, it would seem that in Huronian times, in the higher latitudes of North America, extensive lakes received the finer rock waste from widespread glaciers.

From the varved sediments laid on those old lake bottoms the Pleistocene ice sheets lifted immense masses, piecemeal, as indurated rock. Among the fragments was the one from which the specimen in hand is a remainder. The little stone thus bears record of two periods of glaciation on our continent, the earliest one known and the latest. It is tributary from the former to the latter through an interval of time estimated, on bases of radioactivity and geological data, at one billion two hundred million years.

Museum of Natural History
Battle Creek Public Schools
Battle Creek, Michigan

NOTES ON *HYPOLAGUS BROWNI* AND *LEPUS BENJAMINI*, FOSSIL HARES FROM THE PLEISTOCENE OF ARIZONA

LEE R. DICE

IN 1921 a collection of mammals from Anita, on the Coconino Plateau, Arizona, was described by Hay.[1] Among the new forms were two fossil hares from the early Pleistocene. Although Hay published photographs of these specimens, he did not give figures of the enamel patterns of the teeth. Such figures are of great importance and are presented in this paper. Through the courtesy of Dr. J. W. Gidley I have been allowed the use of this fossil material, which is in the United States National Museum. The figures were drawn by Dora S. Dice.

It is interesting to find that hares belonging to two different subfamilies, Archaeolaginae and Leporinae, lived together in Arizona in the early Pleistocene. At the present time the hares of the subfamily Archaeolaginae are wholly extinct.

Hypolagus browni (Hay)

One species was described by Hay as *Brachylagus browni*, but an examination of the teeth shows that the animal belongs to the genus *Hypolagus*.[2]

Hypolagus browni is notable because most of the upper and lower teeth are present in the specimens and there is thus afforded an opportunity for describing the upper teeth of *Hypolagus*. The upper teeth of other species of *Hypolagus* are not well known. An upper molariform tooth, presumed to be of *Hypolagus vetus* (Kellogg), has been figured, and P^3 and P^4 of *Hypolagus giganteus* (Brown) have been described but not figured.

[1] Hay, O. P., *Proc. U. S. Nat. Mus.*, 59: 617–639.
[2] Dice, L. R., *Journ. Mammal.*, 10: 343. 1929.

The upper molariform teeth of *Hypolagus browni* have quite simple enamel patterns, as is shown by Figure 8. The most anterior premolar, P^2, is unfortunately missing, and so is the last molar, but P^3, P^4, M^1 and M^2 are present. All these agree in

Fig. 8

Fig. 9

Fig. 10

Fig. 11

Fig. 8. *Hypolagus browni.* Enamel patterns of left upper molariform teeth. U.S.N.M. (type) No. 10196. × 4.

Fig. 9. *Hypolagus browni.* Enamel pattern of right P_3. U.S.N.M. No. 10201b. × 4.

Fig. 10. *Hypolagus browni.* Enamel patterns of right lower molariform teeth. U.S.N.M. No. 10201a. × 4.

Fig. 11. *Lepus benjamini.* Enamel patterns of left lower molariform teeth. U.S.N.M. No. 10183. × 4.

having the anterior borders of the interior reëntrant angles somewhat crenulated and the posterior borders of these angles only slightly wavy. The reëntrant angles extend considerably more than halfway across the teeth. There is only a slight development of cement. In all these characters the teeth differ from the molariform tooth [3] believed to belong to *Hypolagus vetus* from the Thousand Creek beds of Nevada, which has only a short reentrant angle, with the enamel rather strongly crenulated, and which has a considerable amount of cement on the inner face of the tooth.

Brown [4] states that the upper molariform teeth of *Hypolagus*

[3] Dice, L. R., *Univ. Calif. Publ. Geol.*, 10: 181, Fig. 5. 1917.

[4] Brown, Barnum, *Am. Mus. Nat. Hist., Mem.* 9: 199. 1908.

giganteus from the Conard fissure of Arkansas have the reëntrant angles extending only slightly more than halfway across the teeth, and that the enamel in the reëntrant angles is crenulated.

As shown by Figure 10, the enamel patterns of the lower molariform teeth of *Hypolagus browni* are quite simple. On the most anterior lower premolar (P_3) the external reëntrant angle extends only about halfway across the tooth and is not crenulated. There is a shallow groove on the external side of the tooth anterior to the main external reëntrant angle, but there is no reëntrant angle on the anterior face of the tooth, such as is found in most modern hares and rabbits. The shape of this tooth is different from that of the corresponding tooth of any other known *Hypolagus*, and the species *browni*, therefore, is distinct.

Near the internal border of P_3 (Fig. 10), opposite the external reëntrant angle, there is on this specimen a small enamel island. Presumably at a younger stage of wear this would be connected with the internal border of the tooth, forming at that time an internal reëntrant angle. If this occurred, the enamel would at that time have had the pattern characteristic of Palaeolagus and other genera of the subfamily Palaeolaginae. This may indicate that the genera *Hypolagus* and *Archaeolagus*, which I have placed in a separate subfamily Archaeolaginae, originated from the Palaeolaginae. However, no other of the three anterior lower premolars of *Hypolagus browni* in this collection show similar islands of enamel, and these, perhaps, were present only in the early stages of wear.

Hypolagus browni, as noted by Hay, was larger than *Brachylagus idahoensis*. The lower jaw is very similar in size to that of the brush rabbit of California, *Sylvilagus* (*Microlagus*) *bachmani*. Several humeri and femurs are shorter and more slender than those of the brush rabbit, but these may have belonged to individuals not quite mature. An innominate bone, No. 10205, is very similar in size to that of an adult *bachmani* from Corralitos, California, but the ischium of the fossil is longer and more slender. The general indication is that the fossil hare was about the size of the brush rabbit or perhaps slightly smaller.

The posterior nares of the fossil are very narrow, being de-

cidedly more constricted than those of *Sylvilagus bachmani*. This indicates that the fossil animal could have had little endurance in running.

Lepus benjamini Hay

Hay [5] states that the posterior borders of the reëntrant angles of the lower molariform teeth in *Lepus benjamini* are crenulated, differing in this respect from *Lepus townsendii campanius*. An examination of the specimens of white-tailed jackrabbits in the University of Michigan Museum of Zoölogy proves this statement to be correct. In none of the specimens of *Lepus townsendii* or *Lepus t. campanius* is the enamel on the posterior borders of these reëntrant angles crenulated, as it is in *Lepus benjamini* (Fig. 11).

The jaw of the type of *Lepus benjamini* is in size and shape almost identical with that of a jaw of *L. townsendii campanius* from North Dakota. Compared with *L. californicus vigilax* from Calaveras County, California, the fossil jaw is distinctly heavier and the diastema is shorter. The indications are that the fossil animal was of about the same size as *Lepus townsendii*, the white-tailed jackrabbit.

Three femurs of large hares are represented in the fossil material. The largest of these, No. 10192a, is shorter and lighter than the femur of an adult female *campanius* from North Dakota, but similar in length to that of an adult *L. californicus vigilax* from Ball's Ferry, California. The shaft has a smaller diameter than either *vigilax* or *campanius*, of similar length, and it is more nearly round in cross-section. The other two femurs, Nos. 10191 and 10192b, are nearly alike in size and shape, but they are much shorter than No. 10192a. In size and shape they agree closely with *L. townsendii campanius* and *L. californicus vigilax*, but they are smaller. No. 10191 seems to be from a mature animal, since its processes are well ossified. This apparently indicates, as Hay supposed, that two species of hares are represented by the femurs. To judge from the size of the jaw the large femur, No. 10192a, should belong to *Lepus benjamini*.

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[5] Hay, O. P., *op. cit.*, 59: 629. 1921.

THE GEMS OF ISLE ROYALE, MICHIGAN

FRED DUSTIN

IT WAS my good fortune to be employed several weeks in the summers of 1929 and 1930 in a survey of the archaeology of Isle Royale for the University of Michigan. The work took me almost completely around its shores and into much of the interior. Part of nearly every Sunday was devoted to a search for gems, and when I was near some of the more noted localities any spare time was employed in traversing the beaches or studying the rocks from which these gems are derived.

Isle Royale extends northeast and southwest for forty-five miles; its surface presents a series of rocky ridges that follow the trend of the island, precipitous on their northern exposures but sloping more gently toward the south. Most of these ridges are formed from lava flows of a very ancient time. For some miles along the north side of Siskowit Bay and at Conglomerate Bay a peculiar conglomerate outcrop is found, whereas from Senter Point in the former to the vicinity of the mouth of Grace Creek at Grace Harbor and south to the shore a red sandstone is predominant, which gives a quite different character to the scenery. This sandstone seems to be barren of gems; the lava and conglomerate form their matrices.

It appears that there were several flows of the once molten material which so largely characterizes the Isle, and in these different formations certain predominating minerals are found. Thus the amygdaloid on the north shore is rich in thomsonites and similar stones; the "Greenstone Range," of which Blake Point is the northeast terminus, carries agates, prehnite and crystal quartz; the range of islands, Smithwick, Mott and Caribou, and the corresponding ridge running southwest, gives chlorastrolites accompanied by prehnite, epidote, datolite and some of the zeolites; the conglomerate furnishes fine carnelians as well as good agates

and some common opal. No carnelians were observed except from the conglomerate, but a few chlorastrolites were obtained from the amygdaloid, the "Greenstone Range" and the conglomerate; in fact, wherever prehnite occurs, one may look for these unique gems; a fine one came to my collection from Hart Cove on the north side of Tobin Harbor, where a seam of prehnite can be seen near the shore.

The several gem stones will be discussed separately.

A map of Isle Royale is to be found on page 2 of this volume.

CHLORASTROLITE

The first reference I have been able to find concerning these stones is in the report of Dr. Charles T. Jackson,[1] geologist, in which he gives the best synopsis of the prehistoric mining, geology, minerals and history of the Isle yet published. On page 418 he says: "Under the copper-bearing bed there is another bed of epidote. . . . This bed contains stellated masses of a mineral which I named chlorastrolite."

In the report of Foster and Whitney [2] the following statement is made: "Chlorastrolite. — This mineral was first observed by Dr. Locke, on the shores of Isle Royale, and afterwards obtained by Mr. J. H. Blake. It was analyzed and described as a new mineral by Mr. Whitney. . . . The name chlorastrolite was given to it by Dr. C. T. Jackson. . . . It occurs in finely radiated, stellated masses . . . hardness 5.5 to 6."

Since Dr. Locke was an assistant to Dr. Jackson, in the absence of any previous reports by Dr. Locke or Mr. Blake, it may be safely inferred that Jackson was the first to note its discovery. Whitney's analysis was somewhat faulty, since he gave the hardness too low and the specific gravity too high. So far as known, Isle Royale is the only place from which chlorastrolites of gem quality have been obtained, although imperfect nodules have been reported from the trap rock of Keweenaw Peninsula.

[1] Published in 1849 as *Executive Document No. 5, 31st Congress, 1st Session, House of Representives.*

[2] Foster, J. W., and Whitney, J. D., *Report of the Geology and Topography of a Portion of the Lake Superior Land District*, Part II, p. 97.

I had no opportunity of observing them in the epidote mentioned by Dr. Jackson, but saw them in place in the brown lava of the islands and on the ridge noted. I collected good specimens both free and in the matrix from the beaches on Smithwick and Mott islands, some from near the Old Light and from the south shore of Siskowit Lake, a few from Scovill Point and Todd Harbor, with occasional ones from Tobin Harbor. Some of the fishermen chisel them out of the rock along the trail from the head of Rock Harbor to Lake Richie and near Chippewa Harbor.

Near the outlet of Siskowit Lake they may be seen in several stages of alteration, both in the matrix and free. Where the alteration is advanced, they have a soapy feel and are easily scratched by the thumb nail. On one of the dumps at Minong Mine I found a small mass of crumbling rock of very different character from that of the breccia-like conglomerate which forms the rock-mass at the mine, filled with soft dark green nodules having the stellate formation of chlorastrolite and presumably altered forms of that mineral. They were easily extracted, and an analysis might be of interest.

There does not appear to be entire agreement among mineralogists as to the place chlorastrolite occupies among minerals, but from various analyses it would seem to be quite closely related to prehnite. On Isle Royale native copper is always associated with prehnite and often disseminated through it in small specks or larger pieces, but in no case have I observed copper in the same relation to chlorastrolite. There seems, however, to be a transitional form, which cannot be described as either of these two minerals. It appears to be an effort of nature to combine two similar minerals with poor success, for it is unlike either, being a mixture of light and dark green, showing no pattern of crystallization but containing specks of native copper.

In chlorastrolite there is quite a range of color and figure. Occasionally one will be found of a pale green shade and very small pattern, a good example of which may be seen on color Plate 3 of Dr. George F. Kunz's *Gems and Precious Stones of North America*, or in *National Museum Bulletin 118*, Plate 7. In my own collection there are stones that appear to be almost black, but

under the pocket lens they reveal the same fine stellations as do the paler stones. Some show a mosaic pattern, others a radiate, resembling prehnite except in color. Some chlorastrolites have patches of pink or flesh color. Under the lens these are seen to be little starlike forms of singular beauty, or else they look like tiny roses. These were shown to a mineralogist who suggested that the pink mineral was thomsonite, but if so, it has been greatly altered, since it has the same hardness, 6.5, as the chlorastrolite. The resorters and fishermen do not seem to appreciate these beautiful little gems, and apparently pass them by, perhaps classing them with "zeolites," as the pink and white thomsonites are locally called.

Fine chlorastrolites have become very scarce, for during the resort season regular trips are made from Minong Lodge and Rock Harbor Lodge to collect them, and in the early spring the fishermen, three of whom have small lapidary machines and do very creditable work, visit the beaches where they are found. They have the first pick after the winter and spring storms, which release the stones from the rock and wash them up on the beaches. Some, especially very small ones, are worn and polished by wave action and show the pattern plainly, whereas others, recently freed from the matrix, require careful examination with the lens to determine whether they are worth cutting; even then one of fine appearance may be worthless, a mere shell of chlorastrolite filled with crystallized calcite or other material which breaks to pieces when placed on the cutter's wheel. Others are hollow, having lined but not filled an amygdule in the lava, and show on the inside a small botryoidal surface. In my collection there is an irregular piece two and one-half inches long, one and one-quarter inches wide and one-half inch thick. It is attached to a piece of brown rock of similar form and dimensions. The two can be separated only by the diamond saw or the slower process of grinding off the rock matrix. How fine a stone this would be is a question; it is light in color, but if well stellated it would be a very unusual gem.

Several of the people who visit Isle Royale year after year have become the possessors of fine chlorastrolites, set in brooches, necklaces, rings and stick-pins. In former years it was not difficult

to find a gem of fair size; now, one three fourths of an inch long is a rarity. I saw one of this size collected in 1929, but it was of only fair quality. A good "greenstone," as they are called in the Lake Superior region, is highly prized by those who love the place of its origin; it has a greater local value and interest on this account.

Professor N. H. Winchell [3] discusses chlorastrolite and gives reasons for considering it to be a distinct mineral. It has a marked pleochroism and a strong individuality in both structure and color. Winchell says: "Its chemical characteristics will be found as distinct as its physical." The collector will notice many green stones on the small beaches where chlorastrolites are found, some of which have the appearance of those gems so far as form and color are concerned, but are structureless. Winchell thinks that these often grade into mesolite on one side and into chlorastrolite on the other and says: ". . . these two minerals are closely allied in origin, structure, and composition, differing principally in the content of iron."

Whether it is a distinct mineral or not, it is certain that the mosaic, stellate and radiate appearance of this gem is unlike that of any other. Its rich light and dark shades of green place it in a class by itself. Its capacity for taking a very high polish and its slightly chatoyant reflections increase its beauty, and the fact that it is a distinctively American gem adds to its interest and to that of the beautiful Isle which gives it to us.

LINTONITE, THOMSONITE AND MESOLITE

In attempting to describe these minerals we are confronted by conflicting and confusing definitions. "When the doctors disagree, who shall decide?" is a true saying, so that if the terms used interlock more or less it will be due to a layman's confusion over the doctors' diagnosis.

In general, the local lapidaries of Isle Royale refer to the gems named above as "zeolites," for all three are collected on the Isle, but most of those obtained are the pretty pink and white stones,

[3] *American Geologist*, 23 (1899): 116–117.

often showing green spots, which I shall describe as thomsonites. They are to be found on nearly every gravelly beach, although the amygdaloid of the north shore is the source of the finest gems of this class. They weather out of the rock in the form of rounded pebbles from the size of a pea to over an inch in diameter, and are collected on the shore by wave action, often receiving considerable polish thereby.

When further polished by the lapidary they show the pretty pink "eyes" or tufts of slender crystals with a silky or pearly luster; occasionally these "eyes" are green or there will be patches of green not showing crystallization. Rarely they contain distinct little masses of apple-green prehnite. In some stones the pink may predominate, and in others green will be the most striking color. They are subtranslucent and the hardness is 5.5. Owing to this comparative softness, they are more desirable as settings for stick-pins, cuff links and brooches than for rings or watch charms.

On Coast Chart 8 (Isle Royale and vicinity), issued by the War Department, Stockly Bay will be noted near the northeastern end. The several bays of which Stockly is the largest are called in general "Five Finger Bay" by the islanders. On the south side of this bay opposite the long island in the upper part of Duncan Bay there is a small beach known locally as "Thomsonite Beach," where some good thomsonites are found as well as a few lintonites; farther southwest in Todd Cove, two miles northeast of where the eighty-ninth meridian touches the shore, a place marked "Thomsonite Beach" will be noted. There are some of these gems at this point, but the true Thomsonite Beach is two and one-half miles southwest, a little beyond the meridian named.

Since this place is seldom visited, some fine specimens may be collected; a few are of the Grand Marais, Minnesota, type, designated by Winchell as mesolite. Opposite Hawk Island near McCargo Cove many thomsonites can be seen in the amygdaloid along shore, but do not seem to weather out to any great extent, probably owing to an unusual hardness of the rock. On the outer beach of the small island southwest of Smithwick Island a pocketful may be collected, but all will be very small.

Lintonite, first described by Peckham and Hall,[4] appears to be the uncrystallized green mineral occasionally associated with thomsonite. I collected in Stockly Bay a very fine gem in which this mineral seems prominent. The cut stone is almond-shaped, one and one-half inches long, three quarters of an inch wide and one-quarter inch thick. The lintonite is two shades of green and is filled with finely radiated tufts of mineral about one-quarter inch in diameter. The outer ends of the needles become delicately pink; the center of the tufts is green. The stone is finely translucent, but it is not a perfect specimen, since there are two or three spots of the brown matrix rock which could not be ground away entirely. Another gem, cut and polished, seems to be wholly of this mineral; its color is dark green; it does not take a good polish and in itself is of little interest as a gem, since the color is too deep and it is only subtranslucent.

Professor N. H. Winchell [5] says of thomsonite: "That reported for several years from Minnesota [near Grand Marais] is mesolite, though thomsonite also occurs. Lintonite is worthy of being classed with the gems. It is allied to the jacksonite of Whitney." Dr. George F. Kunz [6] makes this statement: "From this account [Winchell's] these closely similar minerals would belong strictly as follows: thomsonite, so called, under mesolite, lintonite under thomsonite proper, and jacksonite under prehnite."

The lintonite described by Peckham and Hall would seem to be distinctively unlike the pink and white gems of Isle Royale, and even more dissimilar to the characteristic creamy and brown-spotted stones from Grand Marais called mesolites by Winchell. The last named are scarce on the Isle. The few gems of my own of this type seem to take a more brilliant polish than do the thomsonites, which perhaps indicates a slightly higher degree of hardness. Two small ones are masses of radiate, reddish brown tufts, that appear to the naked eye to have a background of pinkish cream, but under the lens it is seen that the needle-like crystals simply become lighter toward their extremities and produce the

[4] *American Journal of Science*, Third Series, 19 (1880): 122–130.
[5] *Ibid.*, p. 123.
[6] *Mineral Resources of the United States*, pp. 591–592. 1899.

odd effect. One fine little stone has a patch of lintonite which adds to its attractiveness, but which is duller on its polished surface than is the harder mesolite.

The largest cut stone of this kind was made from a section sawed by the lapidary from the matrix, in which it formed a mass sufficiently large to furnish a gem one and one-quarter inches long and three quarters of an inch wide. The ground mass is milky white, containing many brown and white tufts of radiating crystals about one eighth of an inch in diameter. There are specks of copper scattered through it, but so small as to be imperceptible unless the lens is used. It is somewhat flawed, and is not a fine gem although unusual for size and markings.

CARNELIAN

At the head of Siskowit Bay there is a beach that forms an almost perfect arc of a circle, beginning at the site of the old county seat and extending south to Senter Point. It is about three quarters of a mile along the shore line; its gravel and boulders are the results of the disintegrating of the conglomerate rock, which is seen in place at the beginning of the old road to the Island Mine. I have named this Carnelian Beach, for here can be collected as fine stones of that name as one could wish for. They do not run large, but for purity and depth of color they can hardly be excelled. On two occasions my camp was made at this place overnight, which afforded opportunity for a slight study of the rock and the gravel from it.

It is a question whether all the gem stones found there (mostly agates and carnelians) were formed in the rock after it had become consolidated or whether some of them were in the gravel when the cementing process occurred. I would incline to the latter idea. There may still be seen in place agates, some of them large, showing plainly how they have filled irregular cavities in the conglomerate. The northerly half of the beach produces most of the gems, for the southern half is largely sand.

The shore is piled high with gravel lying in two or three terraces, and the pretty red pebbles from the size of a small pea to an inch or more in diameter will attract the attention of the mineral

lover very quickly, and he will note other fine stones, predominantly red outside, showing the formation of an agate or jasper shell filled with a solid mass of pure white quartz crystals. The largest carnelian found was a beautiful specimen about two inches in length, of fine color and texture. Unlike most of the quartz gems of Isle Royale, it did not appear to be flawed.

Another interesting feature of these gems is that a large portion of them are finely translucent, unlike so many carnelians from other localities which are somewhat clouded. Often they are blood-red; others show delicate agate-like formation, and one a deep red little "eye" surrounded by a whitish zone, which in turn is circled by a narrow red line, all on a ground-mass of light carnelian. The prevailing shade is a deep red; a few, however, show pale orange tints.

AGATES

The agates of Isle Royale are not large; the largest noted was about eight inches in diameter. The rock in which they have formed influences their color and markings. The Greenstone Range, from Blake Point to its southwestern extremity near Washington Harbor, is the principal agate-bearing rock, although agates occur sparingly in other places, particularly at Carnelian Beach. On the north side of Tobin Harbor, far down toward Blake Point and along the shores of the islands thereabout, they can be seen in place in the greenstone, and may be collected from the little beaches along shore or in the shallow water contiguous. From time to time a few are freed from the rock and are collected by the resorter who possesses the secret of their locality. Most of them are flawed, some so greatly that they break into pieces. Occasionally one is found fine enough for polishing, usually a fragment. They are generally light in color; the banding is white and pale sard, but, rarely, a deep mottled red. Some are of the "fortification" type, with fine lines of delicate color; others are banded in curves that produce beautiful patterns.

At the southwest end of the Isle near McGinty Cove "Agate Beach" may be noted on the chart. Some fine agates have been collected here, from which it has received its name. While explor-

ing southwest of Minong Mine near McCargo Cove, I collected from an old lake beach, perhaps two hundred feet above the present lake level, a much-weathered agate in its matrix. From its appearance it had lain there for centuries, with its colors fading and its luster diminished.

The finest small agates are those found on Carnelian Beach, where many are unique in color or formation. Deep red color and curious markings give a special character, for we find them in true sardonyx, parallel layers of nearly white and brown; others have outward bands of red in different shades, with a solid center of quartz crystals that look like ice; one has bands of amethyst color, pale brown and white, breaking off into odd figures at right angles. Another shows not a trace of color, but has fine white bandings against clear translucent chalcedony. The most remarkable one of all displays an outside agate formation that incloses a dozen distinct parallel layers of at least ten shades, and another odd specimen looks like a slice of fine-grained beef.

Occasionally a stone will be found which from its beauty can be ranked as a gem, but which almost defies classification. It may have the hardness of quartz and the appearance of a zeolite, or it may have the banded marking of an agate, but display true opal reflections. One pretty gem has the fracture and opacity of jasper, but has fine agate markings, being a true jasp-agate.

Some of the agates from the Greenstone Range have a dark outer coating of green, a mere film of color which has been reported to be chrome; others are similarly coated with red, probably iron.

PREHNITE

Prehnite is one of the most prominent minerals of Isle Royale; there is not a single beach where other gems occur on which it may not be found. It ranges in color from white through pale shades of green to a fine apple-green, and some specimens show that malachite has added its deeper tones in small patches disseminated through the prehnite. Another striking fact is that no prehnite was seen that did not contain more or less native copper, and I have one treasured specimen that bears native silver. I have wondered whether the copper was not the sole coloring agency

of this mineral. Another matter of interest is its close association with calcite, crystal quartz, datolite and some of the zeolites.

In most of such combinations the prehnite seems to have formed in the lava fissures and cavities first; the others were deposited later. Some fine masses collected from Hart Cove in Tobin Harbor show copper, calcite, crystal quartz with prehnite, and, at Todd Harbor and Todd Cove, prehnite with datolite. On Mott Island fine specimens in which were embedded shining masses of copper were collected.

Prehnite distinctly showing crystals is not often found, for the deposits are mammillary and consist of fine little radiate bodies of about one quarter of an inch in diameter, in close contact with each other and forming the mammillated groups that often cover several square inches of surface; the finest example seen was on the mantel at Minong Lodge.

It is not easy to secure a piece of prehnite of gem quality, for if it is sufficiently massive, it is likely to be too pale, or may contain substances which make it useless; also the finest pieces are often flawed. My own collection has one cut gem over an inch long by nearly seven eighths of an inch wide. The color is good, but it is flawed and has specks of copper showing on the polished surface.

At Duluth and vicinity prehnite is called "Minnesota jade," and for color and general appearance is quite appropriately thus named, but these local and fancy names for gems are confusing and altogether too numerous.

AMETHYST

So far as known, no amethyst of good gem quality has been found, but at Singer's Hotel at Washington Harbor the fireplace is formed of fine native mineral specimens, among which masses of this stone are prominent; they were secured in the vicinity, but no opportunity was afforded to learn the particular locality.

On the shore of a long island near the entrance to Tobin Harbor I collected a water-worn pebble of crystal quartz which showed in much of its mass beautiful violet tints; in the rock forming the island I saw other pale amethyst crystals in fissures or seams; also

farther up the harbor, opposite Minong Lodge on the north shore, I secured a small mass of pale amethyst crystals. This gem has also been observed near the outlet of Siskowit Lake; a good specimen was obtained there in 1930. It was mottled with purple, not being of a solid color, but might furnish a fair gem if cut by a skilful lapidary. Good specimens of amethystine chalcedony were collected at Carnelian Beach, some of which are deep purple.

Another interesting form of quartz is sometimes picked up on the beaches of Mott and Caribou islands, fairly clear crystals coated with what has been called an ore of copper. It may be presumed that this is the "smoky quartz" referred to by Foster and Whitney.[7] It is not a true smoky quartz, the coloring being superficial.

At the Minong mine a geode lying on the dump was found to contain transparent quartz crystals, some of them faintly violet. Rarely, rock crystals are found sufficiently limpid to cut good gems, but usually they are only translucent or outwardly coated; few over an inch in diameter were seen.

ROSE QUARTZ

Crystallized rose quartz seems to be a rarity, but on Mott Island two or three specimens were collected that consisted of small masses of pale pink translucent crystals of fair quality. The color is not deep enough for a fine gem, but the stones are of interest to the gem lover on account of their crystal form, and a beautiful specimen that has been cut for me adds an unreported gem to the list of those from Isle Royale.

CHALCEDONY

Under "chalcedony" the United States National Museum classes a dozen gems from agate to jasper, including the cryptocrystalline with the amorphous, but we may, for convenience, confine the term to those highly translucent forms that display little color or pattern and have a waxy luster.

A tiny little gem of this substance from Carnelian Beach is so

[7] Page 107 of work cited in note 2.

brilliant that it reminds one of the "gouttes d'eau," peculiarly limpid topaz pebbles. Another mass, when fresh from the matrix, resembled clear beeswax of a delicate shade.

Solid masses of milk-white quartz crystals are found inclosed in thin shells of chalcedony; they make fine cabinet specimens. Some nodules of this mineral are bluish gray and would be suitable for watch charms.

JASPER

So far as known, jasper is one of the rarer minerals of Isle Royale. Dr. Charles T. Jackson[8] lists "Jasper formed from sandstone, Conglomerate Bay," probably from the outcrop of sandstone at that place. The conglomerate is the same as that observed at Carnelian Beach, and carries some agates, but it has not been broken up to any great extent.

At Carnelian Beach a very few jasper pebbles were collected, but many lumps of quartz mineral were found that lie on the border-line between a true chalcedony and a true jasper, having the uneven fracture of jasper and the luster and subtranslucency of the former. In some specimens the markings of an agate may be observed, and one of this description was cut into two cabochon gems, which for polish and beauty are unsurpassed. Some deep red jasper pebbles were obtained, but none of the blood-red stones characteristic of the jasper conglomerate of Canada were found.

OPAL

Foster and Whitney[9] report that "The agates occasionally pass into cacholong and carnelian." I collected a pebble at Carnelian Beach which shows true opal reflections, but it approaches quartz in hardness. When cut, it made an attractive gem. It is doubtless one of those "border-land" stones which seem plentiful on the Isle. Some mineralogists think that chalcedony is a form of microcrystalline silica, which carries a percentage of opal. If this be true, there is no line between the two forms; only the extremes give typical analyses.

[8] *Catalogue of Rocks, Minerals, Ores, Collected during the Years 1847 and 1848, Ninth Annual Report of the Smithsonian Institution*, p. 365.

[9] Page 107 of work cited in note 2.

DATOLITE

Datolite was reported by Foster and Whitney [10] as being plentiful at a mining locality in the fractional southwest quarter of Section 10, T. 65, R. 34. I had no opportunity to visit this place which is adjacent to "Epidote," another mining claim named for the prevalence of the mineral of that name, but collected good specimens of the massive form on the north shore at the true Thomsonite Beach. One piece as large as the hand is porcelain-white, with a faint tinge of pink near an edge. It shows thin layers and lenses of prehnite at one end.

None of the beautiful pink and flesh-colored datolite like that from the Upper Peninsula was seen, nor did I observe any crystals such as were reported at Datolite by Foster and Whitney.

The cut gems are pleasing; they take a good polish when not weathered, are slightly subtranslucent and would be suitable for beads.

EPIDOTE

Epidote, sometimes called pistachio stone from its peculiar shade of green, is found both massive and crystallized at Epidote near Epidote Lake about a mile and a half east of Chippewa Harbor. The epidote rock which takes its name from that mineral is conspicuous along the shore in a pale green band, but the mineral is a much deeper green, sometimes becoming brown or brown-green. I found no crystals of a size suitable for gems, but did secure a fine lump of the massive variety that weighs half a pound or more and also a smaller piece from which a good gem was cut. The intense color, in both the massive and crystalline forms, causes it to be held in slight esteem, although it is of considerable interest as a mineralogical gem.

WOLLASTONITE

Wollastonite is mentioned by Foster and Whitney: [11] "This mineral, or table-spar, . . . occurs . . . on Isle Royale, near Scovill's Point. Specimens . . . differ much from the same

[10] Page 101 of work cited in note 2.
[11] Page 108 of work cited in note 2.

mineral, as it occurs elsewhere; so much so, indeed, that their real nature could only be learned by chemical analysis. The mineral, as it here occurs, is compact, of a light, flesh-red color, and remarkable for its exceeding toughness, surpassing in that quality any mineral, or rock known."

In the catalog of minerals by Dr. Jackson, already cited,[12] mention is made on pages 362-363 of nine specimens of "Jacksonite and compact table spar" and on page 366 of one specimen. Again we find the doctors disagreeing, for the following statement is made by William F. Foshag and Esper S. Larsen: [13] "A specimen labeled 'Wollastonite, Isle Royale, Mich.' in the United States National Museum was recently noticed to have the general appearance of the eakleite from the original locality at St. Inez, California, and further study has confirmed the suspicion that the mineral actually is eakleite. . . . Microscopic examination showed that it is made up mostly of eakleite. . . . The Isle Royale mineral is finer fibered and is less pure."

In view of these dissenting opinions in which both parties have proved their cases by chemical analysis, it seems safe to call wollastonite two specimens of tough, compact mineral of a slightly pinkish shade and another small sample showing the crystallization of table spar. These were collected on Mott Island; the smaller massive piece was afterward cut as a cabochon gem. Its peculiar appearance, unlike that of any other stone, makes it of some interest, but it is not showy enough for wear, although a good cabinet specimen.

MISCELLANEOUS

In addition to the zeolites mentioned, some fine specimens of stilbite, pectolite and perhaps other minerals may be collected. At Washington Harbor I heard of apophylite, but saw none, although it has been reported from that vicinity.

Two porphyry pebbles of such compactness and fine, inclosed crystals as would warrant their cutting for gems were collected at Todd Harbor, and also a piece of what appears to be satin spar.

Some pitchstone was collected and arrow-points of this mineral

[12] See note 8. [13] *American Mineralogist*, 7 (1922): 23.

were seen; others called obsidian are probably of this material, which has been reported as forming a large mass in the lava, although record of the locality seems to be lost.

Good calcite crystals were obtained, one or two of greenish shade, others pink; also a few clear and colorless ones. Though too soft for gems, some are well worthy of a place in the cabinet.

Barite is found in good specimens at Washington Harbor, and a fair piece was secured at Todd Cove.

SUMMARY

In conclusion it may be said that, though Isle Royale will not be a source of wealth through its gems, its supplies of chlorastrolites, thomsonites and carnelians will not be exhausted for years, and the pleasure derived from seeking and collecting will be experienced by visitors who love these beautiful "flowers of the rocks."

Minerals like wollastonite, long ago reported exhausted, will in all probability be discovered from time to time, and perhaps amethysts of gem quality may be found. Crystals of datolite, apophylite and epidote might be gathered, but some of the zeolites that have been briefly mentioned are also worth looking for.

Although the old mine dumps are of more interest to the mineralogist than to the gem collector, a good crystal or nodule of gem quality may sometimes reward the seeker, and the small beaches will continue to be the popular resorts for the tourist or sojourner.

Saginaw, Michigan

A LIMESTONE CHIEFLY OF ALGAL ORIGIN IN THE WASATCH CONGLOMERATE, SOUTHERN WASATCH MOUNTAINS, UTAH

ARMAND J. EARDLEY

OCCURRENCE AND DISTRIBUTION

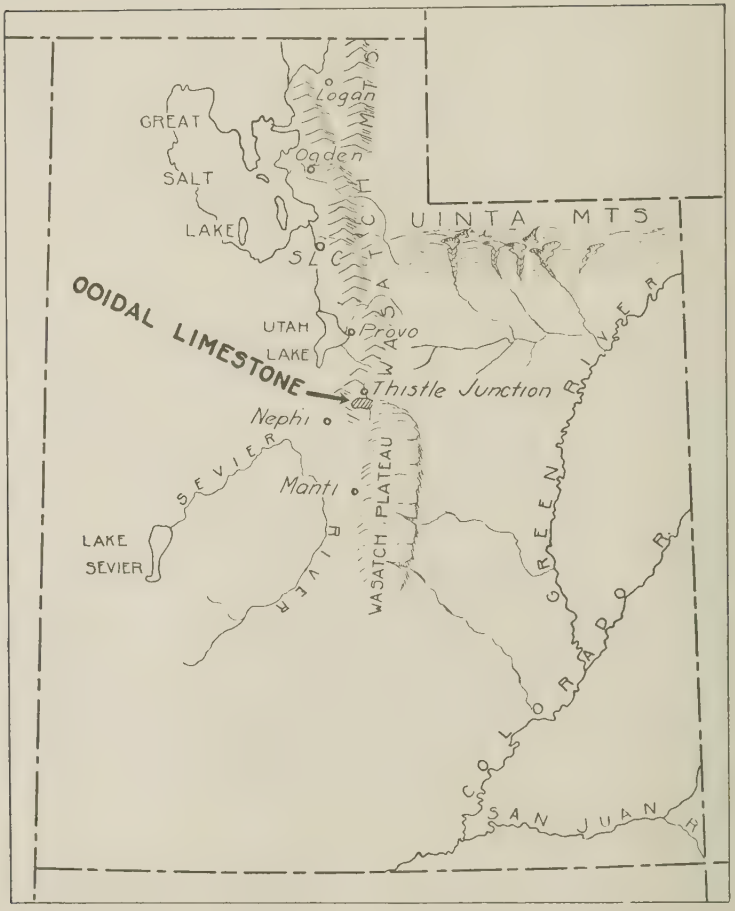
FLANKING the eastern slopes of the Wasatch Mountains both north and south of the junction with the Uinta Mountains there is a very coarse, red or gray, roughly bedded deposit known as the "Wasatch Conglomerate." It originated from rapid erosion of high mountainous areas thrown up during the Laramide revolution. It was deposited over the truncated Paleozoic and Mesozoic strata which were folded and thrust in this same revolution. Since the deposition of the conglomerate it has been eroded intermittently to the present time, so that in places it has been entirely removed. Its maximum thickness is over 1,000 feet.[1]

A limestone bed with maximum thickness of 300 feet occurs in the Wasatch conglomerate of the southern Wasatch Mountains in T. 10 S., R. 2 E., and T. 11 S., R. 2 E., and also to an unknown extent eastward. It is this limestone which the writer wishes to discuss in the present paper.

The map of the state of Utah (Map 42) shows the geographic position of this limestone (denoted as ooidal) and also other features which will be referred to.

The best exposures of the limestone are at Tinnie Flat, Santaquin Canyon, and on the east side of Frank Young Canyon, a tributary to Payson Canyon. At Tinnie Flat it is exposed as a

[1] Eardley, A. J., *Stratigraphy, Structure, and Physiography of the Southern Wasatch Mountains.* Presented as doctor's thesis to Princeton University, 1930. Not yet published.



Map 42. Map of Utah, showing area of ooidal limestone and other points referred to in this paper

cliff 300 feet high, rests directly upon the truncated Carboniferous strata, and is overlain by the conglomerate. In Frank Young Canyon it is both underlain and overlain by the conglomerate. These exposures indicate that the limestone is an interbedded

member near the local base of the formation, since the underlying part of the conglomerate had thinned out and disappeared before the Tinnie Flat section was reached, leaving the limestone as the basal member. The diagram (Fig. 12) represents these relationships.

CORRELATION AND NAME

The type locality of the "Wasatch Group," which is in Echo Canyon, was first described by Hayden.[2]

He noted variegated sands and clays at the summit, deep yellow sandstones in the upper part of Echo Canyon, and a

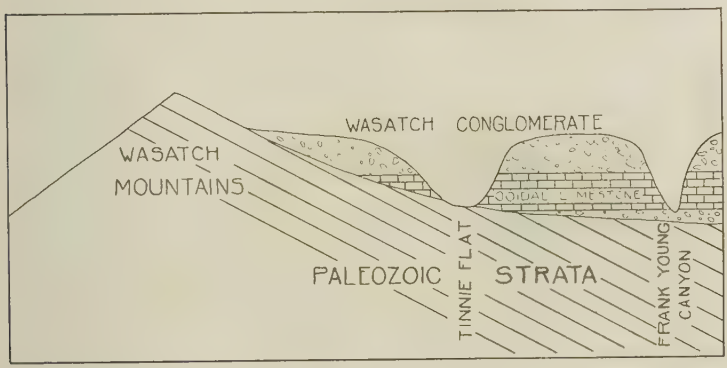


FIG. 12. Section showing stratigraphic and structural position of ooidal limestone

conglomerate about 1,500 to 2,000 feet thick sculptured into very fantastic forms and standing in almost vertical cliffs in the lower part of Echo Canyon and in Weber Canyon. He correlated the lower Wasatch conglomerates in Echo Canyon with the basal conglomerate beds at Almy, not far distant in southwestern Wyoming. Veatch thought this correlation correct.[3] This

[2] Hayden, F. V., *Preliminary Field Rep. U. S. Geol. Surv. of Colorado and New Mexico*, p. 90. 1869.

[3] Veatch, A. C., *Geography and Geology of a Portion of Southwestern Wyoming, U. S. Geol. Surv., Prof. Paper 56*, p. 89, 1907.

series, which has been called the Almy formation by Veatch, constitutes the lowest of three formations, all of which he includes in the Wasatch Group. A part of the stratigraphic section that concerns us here is compiled from Veatch's report as follows (Fig. 13).

The term "group" appears to have been used by Hayden interchangeably with "formation," and now, owing to the fact that the Wasatch is so often spoken of and written of as a formation with divisions also called formations, the nomenclature is somewhat confusing. No attempt can be made here to clarify the situation. The coarse conglomerate immediately overlying the truncated Mesozoic and Paleozoic rocks east of the Wasatch Mountains is generally known as the Wasatch conglomerate, which name will be retained in reference to the coarse conglomerate of the southern Wasatch Mountains. The geologic map of Utah shows that the conglomerate east and northeast of Salt Lake City is separated from the great Tertiary basin to the south by the Uinta Mountains. This prevents the possibility of tracing the conglomerate formations from Echo Canyon to the southern Wasatch Mountains. Nevertheless, the similar character of the conglomerate and the same stratigraphic position seem to indicate that they are essentially of the same age.

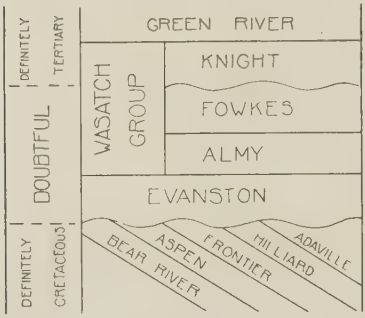


Fig. 13. Stratigraphic section of Cretaceous and Tertiary formations in southwestern Wyoming (after Veatch)

Mr. L. S. Russell of the Canadian Geological Survey has identified shells from the limestone lens within the conglomerate as *Goniobasis simpsoni* or *Goniobasis tenera.*

They constitute a fresh-water fauna, and as such are not of much use in close correlation. Mr. Russell ventures a probable correlation with the Knight formation of southwestern Wyoming.

They may be definitely regarded as lower Eocene, but nothing more can be accomplished with such meager information.

Spieker and Reeside [4] have described a fresh-water limestone which occurs between upper and lower Wasatch beds in the Wasatch Plateau. It is possible that the fresh-water limestone herein described is equivalent to all or part of this "Flagstaff" limestone member of Spieker and Reeside. They represent the Flagstaff as thinning out and disappearing to the north, but it is possible that it can be traced laterally into the southern Wasatch fresh-water limestone. Fresh-water gastropods are common fossils, but these are of little value for close correlation. The limestones are of different lithologic types, but this has little bearing on their contemporaneity.

No name will be given to the fresh-water limestone described in this paper. It may prove to be continuous with the Flagstaff formation and in this event would require no different appellation.

DESCRIPTION OF LIMESTONE

Loughlin [5] described the limestone in the following terms:

> It consists for the most part of a dense matrix full of large and small grey to brown concretions of such shapes as to suggest that they were mostly formed by accretions of calcium carbonate around nuclei of shells.

The proportions of the two dominant constituents of the limestone, matrix and "concretions," vary widely. In one place, or at one horizon, the limestone may consist almost wholly of matrix and at another the rock may be made up chiefly of "concretions" with only a very small portion of matrix. (See Pls. XXXII–XXXIII.) Specimens with a predominance of matrix were observed, generally at a considerable distance from the ancient shore.

The matrix is creamy white to creamy brown, dense and solid.

[4] Spieker, E. M., and Reeside, J. B., Jr., "Cretaceous and Tertiary Formations of the Wasatch Plateau, Utah," *Bull. Geol. Soc. Am.*, 36: 448–449. 1925.

[5] Loughlin, G. F., *Ore Deposits of Utah, U. S. Geol. Surv., Prof. Paper 111*, p. 326. 1920.

In thin sections it is very finely crystalline and appears to have been derived from a compacted, flocculent precipitate. (See Pl. XXXIV.) In places patches of clear calcite crystals were noticed. (See Pl. XXXIII.) Chemical tests show that the matrix is almost pure calcium carbonate. It contains less than 0.03 per cent of insoluble material, including iron, magnesium and aluminum. The insoluble residue from both matrix and the concentric aggregates was observed under the microscope and found to consist chiefly of small, fairly well-rounded quartz grains probably of wind-blown origin, and a few dark-red hematite grains. The matrix is, therefore, an accumulation of virtually pure calcium carbonate.

The nodules with concentric structure which Loughlin calls "concretions" will be referred to in this paper as "ooids." The term "concretion," according to Grabau [6] and Twenhofel,[7] should be limited as a name to various aggregates of mineral matter which are of inorganic origin. The writer believes that the nodules of the fresh-water limestone of the southern Wasatch Mountains are of organic origin and, therefore, finds the term "concretion" not suitable for use in describing them. Kindle [8] has used the name "marlyte balls" for spheroidal masses of $CaCO_3$ forming at the present time in certain fresh-water lakes as the result of the activity of algae and associated plants. Although the writer believes that the nodular masses here under consideration are similar in origin to marlyte balls, he does not feel warranted in applying this term, which implies a specific manner of origin, to objects formed in past geologic ages by an imperfectly known process.

The term "ooid," which is here proposed, is derived from Greek *oon*, meaning "egg," and *eidos*, meaning "shape." The definition will not be more precise than "a roughly egg-shaped aggregate of mineral matter probably of organic origin." In order to make the definition as general as possible neither the texture, structure, size, kind of material, nor time of formation relative to the inclosing rocks will be included.

[6] Grabau, A. W., *Principles of Stratigraphy*. 1913.

[7] Twenhofel, W. H., *Treatise on Sedimentation*. 1926.

[8] Kindle, E. M., "Nomenclature and Genetic Relations of Certain Calcareous Rocks," *Pan-Am. Geol.*, 39: 365–372. 1923.

The ooids of the fresh-water limestone of the southern Wasatch conglomerate range in size from submicroscopic to six inches in diameter. They are darker than the matrix, but differ in color from it. If the matrix is creamy white, the ooids are light tan and gray. If the matrix is creamy brown, the ooids are somewhat deeper brown. Nearly all ooids have nuclei which consist of snail shells, pebbles or fragmentary pieces of other ooids. The nucleus is usually eccentric in position, with enveloping layers of calcium carbonate, sometimes in considerable number, depending on the size of the ooid. About 50 per cent of the ooids are rather porous, having many irregular cavities distributed radially through the concentric layers. The rest are quite solid. The ooids are composed of pure calcium carbonate with only a very few inclusions of possibly wind-blown sand. In certain places the nuclei are usually pebbles, either of limestone, quartzite, or sandstone, and range in size from one quarter of an inch to two inches in diameter. In such places the limestone, if analyzed as a whole, is very impure and may even grade into the conglomerate.[9]

ORIGIN OF THE LIMESTONE

Evidence from general relationships

The rather extensive bed of ooidal limestone most probably represents the deposits of a local lake whose western and northern shores lay at the base of an imposing mountain range (now the southern Wasatch Mountains), where clastic fluviatile sediments were accumulating. These fluviatile sediments consist of coarse, poorly sorted, heterogeneous material and show in places high initial dips. Such characteristics indicate that the clastic sediments were probably deposited as alluvial fans. If the outer margins of two alluvial fans coalesce, a basin is often formed, surrounded by the fans and the escarpment at the foot of which the fans are built. It appears that the lake of the ooidal limestone may have existed between two such alluvial fans. The postulated topography surrounding the lake is illustrated in Figure 14.

There is also a possibility that the lake was an arm or protected

[9] Loughlin, G. F., *loc. cit.*

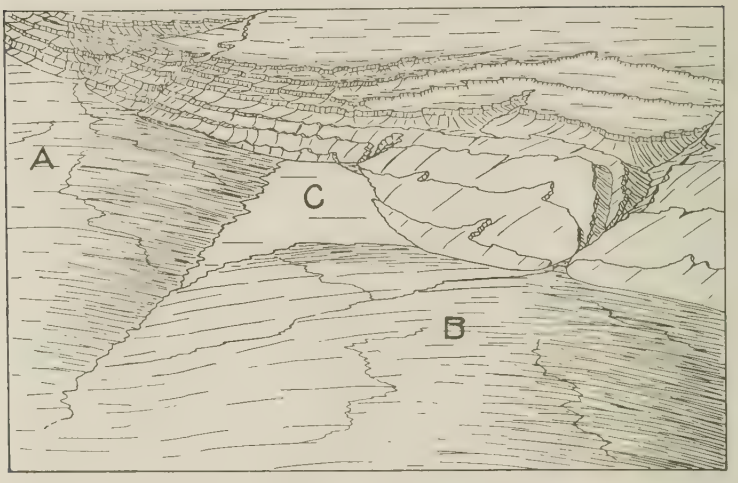


FIG. 14. Postulated setting of the lake in which the ooidal limestone was formed. *A* and *B* are large alluvial fans built at the base of a high mountain range. They coalesce at their outer margins to form a basin which is occupied by a lake, *C*, in which the ooidal limestone is supposed to have formed. The range, as depicted, is roughly reconstructed from the present strikes and dips of the beds of the southern Wasatch Mountains, and attempts to represent the writer's conception of its appearance shortly after the major orogeny of the Laramide revolution. The canyon into whose mouth alluvial fan *A* extends marks the approximate site of the present Salt Creek Canyon. The canyon from which alluvial fan *B* has formed marks the approximate site of Spanish Fork Canyon. The nature of the mountains of this early period and the position of the large fans are to a considerable extent hypothetical

embayment of a much larger lake in which the Flagstaff limestone [10] of the Wasatch Plateau was deposited. If the ooidal limestone can be traced into the Flagstaff, then the lake in which the ooidal limestone was deposited must have been confluent with this larger lake to the east and not completely inclosed by alluvial fans. In either case the writer believes that the small lake was intimately associated with alluvial fans which were in the process of construction.

[10] Spieker and Reeside, *loc. cit.*

The fact that the limestone is almost pure $CaCO_3$ indicates that it was precipitated in a lake of clear water free from any clastic material. Influxes of sediment-laden waters, however, entered the lake from time to time and spread considerable clastic material over the accumulating limey deposit. The water was turbid only in the vicinity and at the time of the ingress because the clastic material was soon incorporated in the clean calcium carbonate sediments, chiefly as nuclei of the growing ooids.

Intermittent currents of considerable velocity in the lake are also indicated by the pebble nuclei, many of which are large and could have been transported into the area of lime deposition only by streams and currents of considerable velocity. The ooids, as Bradley [11] has pointed out, for a different formation, show signs of having been rolled over from time to time. This rolling is recorded by the variations in direction of growth of the concentric layers.

The presence of fresh-water gastropods, types now found in streams, shows that the waters of the lake were fresh. (See section on "Correlation.") The limestone closely resembles certain fresh-water marls and thus tends to confirm the evidence of the fossils.

Evidence from ooids

The precipitation of the $CaCO_3$ of the matrix or the ooids may be the result of either inorganic reactions or of organic metabolism, or a combination of these two. If the origin is assigned to life processes, then all those plants or animals that secret silica are immediately ruled out, because of the complete absence of silica except in the form of a few wind-blown sand grains. Diatoms, the usual contributors of the silica content of "marls" and fresh-water limestones, were looked for in the insoluble residues and in thin sections, but none were found. Only those life forms that cause the precipitation of calcium carbonate need be considered.

The origin of the ooids can be fairly well established from a study of present-day ooids, which they so closely resemble. H. Justin Roddy [12] makes a valuable contribution to this subject

[11] Bradley, W. H., *Algae Reefs and Oolites of the Green River Formation, U. S. Geol. Surv., Prof. Paper 154-G*, p. 219. 1929.

[12] Roddy, H. Justin. "Concretions in Streams Formed by the Agency of Blue-green Algae and Related Plants," *Proc. Am. Philos. Soc.*, Vol. 54. 1915.

in his study of the "lake balls" or "water biscuits" of Lancaster County, Pennsylvania. He concludes that the agents which cause the formation of the ooids in the Little Conestoga River are blue-green algae and associated plants. His evidence that the ooids are a result of the life processes of these plants is as follows:

(1) The color of all growing specimens in the stream is the characteristic bluish green color of the Cyanophyceae, while those exposed to rain and sunshine are greyish white. Careful microscopic examination of such growing specimens also reveals a varied thallophytic flora, mainly of the Cyanophyceae. Species of the genera *Gleocapsa*, *Gleotheca*, *Aphanocapsa*, *Nostoc*, *Oscillatoria*, and *Rivularea* have been identified. Associated with these are several of the green algae (Chlorophyceae). Many species of *Diatomaceae* and *Desmidiaceae*, which generally live in close association with the blue-green algae, have also been identified and have, no doubt, contributed the siliceous matter which is so disseminated through the calcareous matrix. The charas are also occasionally present, contributing a small percentage of so-called marly material. Some bacteria have also been found in association with the other plants, but the bacteria have probably had little to do with the calcareous deposition, but may contribute the iron which is found in every "concretion."

(2) The arrangement and structure of the laminae also favors the view that these concentric accumulations are due to life processes. That periodic accretion alternates with a period of quiescence is shown plainly by the concentric laminations of nearly uniform thickness. The open porous texture of each lamina within, and the more solid character without, like the concentric arrangement is due, without doubt, to the seasonal conditions of the region. Since algae are essentially thermophilic plants, each winter destroys many of them, and stops the growth of most of the rest; and thus, at the beginning of the plant year (spring), few and widely scattered algae at first produce slow and scattered accretion of the limy matter; later the plants become more and more abundant, and by summer they are crowded over the surface of each mass. This distribution of the algae seasonally would naturally have its effects upon the structure and arrangement of the limy matter, giving a decided, though rough, coralline appearance to the inside portion, and a more compact texture to the outer part. The theory just given has been confirmed by a study of the distribution of the algae on the concretions through the seasons.

(3) The observation that the lamellar accretion seems to progress more rapidly on the under side of a concretion proves that the formations are not due to mechanical precipitation of calcium carbonate through evaporation or changes of temperature. It does, however, suggest that the secretion or precipitation is chemical and dependent on a life process that produces conditions for chemical reaction where plants or animals are most abundant.

A comparison of the ooids of the southern Wasatch Mountains with those whose growth has been studied by Mr. Roddy shows

such a close similarity that the arguments used for the origin of the latter might well apply to the origin of the former. It is immediately suggested, therefore, that the activity of algae was chiefly responsible for the origin of the ooids of the Tertiary limestone of the southern Wasatch Mountains. This conclusion is substantiated by other investigations.

W. H. Bradley [13] has studied algal reefs and ooids forming at present in Green Lake, New York, with the particular object in mind of investigating similar deposits of the geologic past, and finds that such study assists greatly in the interpretation of the spongy structure in many fossil reefs. Although it is only rarely that the complex assemblages of algae leave molds of the individual filaments or unicells from which generic determination can be made, he finds the deposit to be highly distinctive and not readily confused with limestone of any other kind.

Regarding the ooids he says: "If the pores of these pebbles [found on the shore near Squaw Island, at the north end of Canandaigua Lake, New York] were filled with secondary calcite they would be strikingly like many of those from the Green River formation." [14]

Bradley found that the dense felt obtained from the material at Green Lake, New York, consisted of an assemblage of blue-green algae and a few green ones. The genera *Microcoleus* and *Palmella* predominate.

He believes that many of the reefs of the Green River formation have been formed by unicellular algae almost identical with *Chlorellopsis coloniata* Reis. He has not found indisputable calcite molds of filamentous algae in the Green River formation, but certain parts of the "Manti beds" have provisionally been referred to the indefinite filamentous form genus *Confervites* Brogniart.[15]

Material from the southern Wasatch ooidal limestone was submitted to Mr. Bradley, who kindly examined it and communicated the following information:

A thin section of a porous concretion shows "no trace of Chlorellopsis, but does have very nicely preserved spongy struc-

[13] Bradley, W. H., *op. cit.* [14] *Ibid.*, p. 219. [15] *Ibid.*, pp. 207–208.

ture such as is now forming in the algal deposits of Green Lake, New York. The spaces between the masses of spongy stuff in the thin section are filled with more coarsely grained carbonates apparently deposited later. The recurrent thin bands of dense and more darkly colored algal deposits spaced one to several millimeters apart in these nodules may have formed in winter, when the activity of the algae was reduced." (See Pl. XXXIV.)

Another thin section of a smaller non-porous concretion with "dense layers around a shell fragment does not have any decisive characteristics by means of which I could be sure whether it is algal or an inorganic incrustation." (See Pl. XXXV.)

It appears, therefore, that at least the porous ooids of the limestone here discussed are of algal origin. Others, especially the smaller dense ones which have a maximum diameter of one inch, with the alternating light and dark layers closely spaced, are possibly of algal origin. However, the fact that the porous ooids have in part also dense texture and closely spaced layers suggests that the entire growth resulted from algal action; the porous layers represent periods of abundant growth and possibly a diminished supply of calcium carbonate.

A typical ooid, three inches in the long diameter and two and one-half inches across, contained about forty-five concentric dark layers. This may indicate that the ooid required about forty-five years to grow to its present size. Growth finally ceased, probably because of burial.

The conclusions regarding the ooids of the fresh-water limestone of the southern Wasatch Mountains, in light of the evidence above, may be summarized as follows:

(1) The porous ooids, which constitute a good part of the limestone, were formed by blue-green and possibly also green algae.

(2) The genera of the algae are indeterminate.

(3) It is likely that more than one genus, even an assemblage of genera, of algae were present.

(4) The smaller, non-porous ooids may have been formed by physicochemical incrustation, but the evidence is suggestive of algal origin for them also.

(5) Part of the porous ooids is of physicochemical origin, namely, the secondary calcite filling.

(6) The alternate dense and porous layers suggest seasonal changes.

Evidence from matrix

The origin of the solid, dense matrix of the limestone presents a more difficult problem, which cannot be settled at present with any great assurance. Its insoluble content is only 0.01 to 0.02 of one per cent and, like that of the ooids, is negligible. The chemical analyses indicate the same source of origin for the $CaCO_3$ as for the concretion; at least, a different source is not suggested, but still it is not disproved.

The megascopic and microscopic appearance suggest it to be a marl,[16] now hard and massive.

The origin of marls is ably discussed by Kindle,[17] whose studies lead to the following general conclusions:

(1) Marl is limited to relatively small areas, in protected bays, the shores of islands free from strong wave action, wide shallow areas protected by bars or islands, and to shallow narrow straits protected from wave action.

(2) Deposits of marl occur in the warm epilimnion zone and above the cold hypolimnion zone. Waters in the cold deep zones are rich in CO_2 and dissolve any settling $CaCO_3$ that may have been formed near the surface.

(3) A hydrogen ion concentration at the surface of 7.8 to 8.2 is necessary.

[16] The name "marl" is often applied somewhat vaguely by geologists, especially in America, to a number of fine-textured sediments. For instance, according to the U. S. Geological Survey, the term "marl" is used for any earthy, generally incoherent material that is appreciably calcareous or glauconitic. Qualifying adjectives are used to distinguish the different kinds of marl, such as "green-sand," "shell," etc. In this paper the term "marl" is used to mean only those types of lake sediments of which E. M. Kindle speaks in the following citations. Kindle's marl is characterized by being almost pure $CaCO_3$.

[17] Kindle, E. M., "Rôle of Thermal Stratification in Lacustrine Sedimentation," *Trans. Roy. Soc. of Canada*, Sect. IV, Ser. III, 21 : 1–35. 1927. *Idem*, "A Comparative Study of Different Types of Thermal Stratification in Lakes and Their Influence on the Formationof Marl," *Journ. Geol.*, 37 : 150–157. 1929.

(4) Calcium carbonate is precipitated in the summer during the period of thermal stratification.

(5) The precipitation is most rapid during the warmest part of the season.

(6) The calcium carbonate in the epilimnion zone must reach saturation before precipitation occurs.

(7) Saturation of $CaCO_3$ is produced by reduction of CO_2 by evaporation, photosynthesis in plants which extract the CO_2 from the water, and to a lesser extent by rising temperature, which lessens the solubility.

(8) Shallow protected areas of lakes in which mixture with cold deep waters rich in CO_2 is unlikely afford the best opportunity for the water to become saturated with respect to $CaCO_3$. Conditions are also favorable for the deposition of $CaCO_3$ where altitude and latitude do not keep the temperature of the epilimnion zone too low for the development of Chara, Potamogeton, and other plants that extract CO_2.

In 1927 Kindle wrote as follows:[18]

> It appears from the preceding discussion that plant life of widely different types is directly responsible for the separation from the water of much of the $CaCO_3$ of marl deposits. This is accomplished through the abstraction of CO_2 from a saturated or nearly saturated solution of $CaCO_3$. Loss of CO_2, whether it results from the photosynthesis of plants or rising temperature, is directly connected with thermal stratification of water.

The conditions necessary for the deposition of marl are, as Kindle suggests, very similar to those under which the ooids of the ooidal limestone of the southern Wasatch Mountains are believed to have formed. Therefore, an environment suitable for marl deposition probably prevailed in the Eocene lake in which the ooidal limestone was deposited. This fact, together with the similarity in color, composition and occurrence of the matrix of the ooidal limestone and the marl of present fresh-water lakes, leads the writer to believe that the matrix of the ooidal limestone is a lithified marl. The ooids probably represent concentric deposition around nuclei of layers of calcium carbonate formed by blue-green algae and possibly by associated plants. The matrix

[18] On page 35 of the first article cited in note 17.

probably represents a fine flocculent precipitate of calcium carbonate caused by the extraction of CO_2 from a saturated solution of $CaCO_3$ by the entire assemblage of plants and by the physical agents of evaporation and rising temperature.

One definite difference between the marls and marlyte balls that are forming today and the limestones discussed here is that in almost all of the former numerous diatoms are found. The absence of these silica-producing diatoms is conspicuous in the latter.

The area covered by the fresh-water ooidal limestone of the southern Wasatch Mountains is, perhaps, much larger than the portions of the small lakes that Kindle has studied. Also, the thickness of the ooidal limestone is considerably greater than would accumulate in such shallow lakes as he describes. Nevertheless, the size of the lake as defined by the extent of the ooidal limestone is within the limits of small fresh-water bodies suitable for marl deposition. The only condition that must have existed in order that lime precipitation over the entire bottom may have taken place is that the lake be shallow enough throughout to eliminate zoning of temperatures within the lake waters. In order to account for a thickness of 300 feet of limestone, either subsidence of the lake floor equal in rate to the rate of accumulation or increase in height of the rim of the lake by the growth of the alluvial fans must be postulated.

COMMERCIAL VALUE

This ooidal limestone is being quarried and used for interior decoration in Salt Lake City and other cities in the United States. Museum specimens are sold by Ward's Natural Science Establishment. The polished stone has a pleasing, buffish cream color and an attractive texture. When dark brown varieties are used as trim and the lighter shades as panel an excellent combination is effected and for many purposes should be as usable as imported "marble." It takes a polish easily and lends itself well to cutting. Some difficulty was experienced in getting large blocks when the quarry was first opened, but now good-sized pieces are obtained. The rock is particularly free from small fractures and therefore proves to be quite strong and durable.

The quarry is situated on the east side of Thistle Canyon. It has a loading platform at the railroad tracks and is operated by the Nebo Marble Co., of Salt Lake City.

SUMMARY

A limestone flanking the eastern slopes of the southern Wasatch Mountains and existing as a lens within a coarse conglomerate of Wasatch age is found to consist of two parts, namely, matrix and ooids. The ooids are believed to be chiefly of algal origin. The matrix represents a precipitate of pure $CaCO_3$, the deposition of which is believed to have been caused by its concentration to the saturation point by a varied plant assemblage, of which blue-green algae probably predominated, and also by the physical processes of evaporation and temperature changes.

The body of water in which the limestone was deposited occupied a basin formed between two large alluvial fans whose outer margins coalesced. The line of contact of the fans was the lowest place in the rim of the basin and, perhaps, allowed the inclosed lake to overflow and become confluent with a much larger lake to the east. The ooidal limestone lake was probably so shallow throughout the area of limestone deposition that the water was not thermally stratified. The lake was clear and free from clastic sediments except at irregular intervals when torrential streams from the high mountains to the west flowed into it and spread a considerable quantity of sand and pebbles upon the limey mud. Many of these pebbles served as nuclei about which algae attached themselves and deposited concentric layers of calcium carbonate. The alternating porous and dense layers in the ooids may possibly indicate seasonal changes.

ACKNOWLEDGMENTS

The author wishes to acknowledge the helpful criticism of Mr. W. H. Bradley of the U. S. Geological Survey and also of Professor G. M. Ehlers of the Department of Geology of the University of Michigan.

University of Michigan

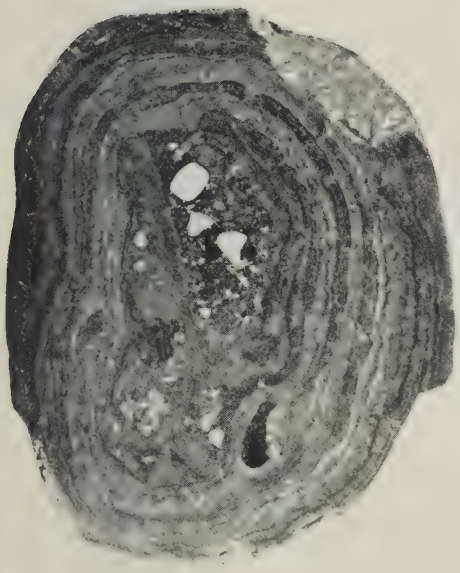


FIG. 1

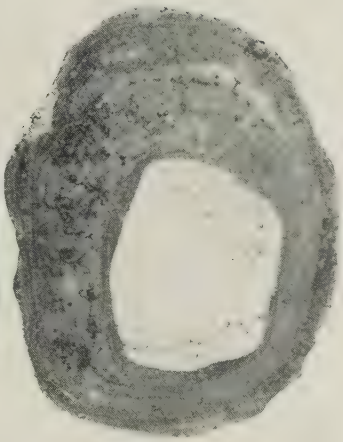


FIG. 2

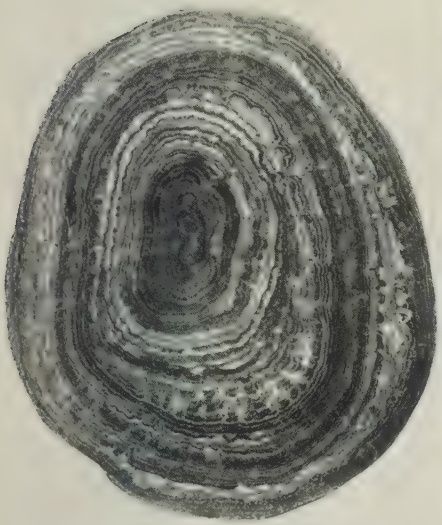


FIG. 3

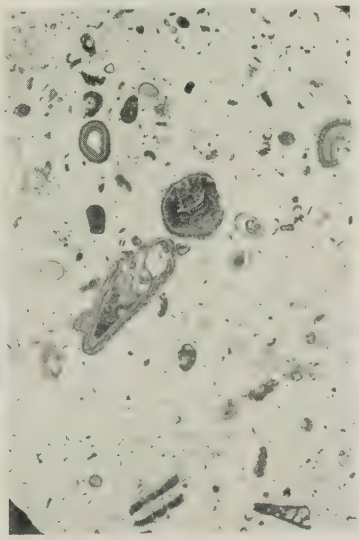


FIG. 4

FIG. 1. Ooid with nucleus formed of coarse sand grains and limestone matrix. × 1
FIG. 2. Ooid with quartzite pebble nucleus. × 1
FIG. 3. Ooid showing radiating cavities and cuspate structure of concentric layers. × 1
FIG. 4. Polished slab of ooidal limestone which is composed chiefly of creamy white matrix. Ooids are light brown. × ½

PLATE XXXIII

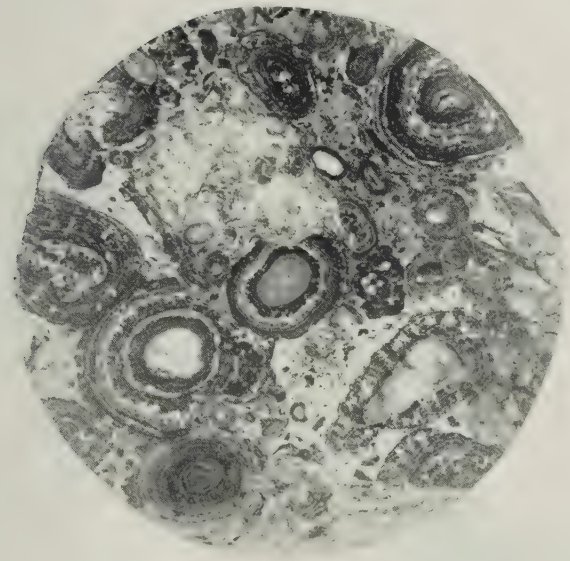


FIG. 1. Polished section of ooidal limestone. × 1

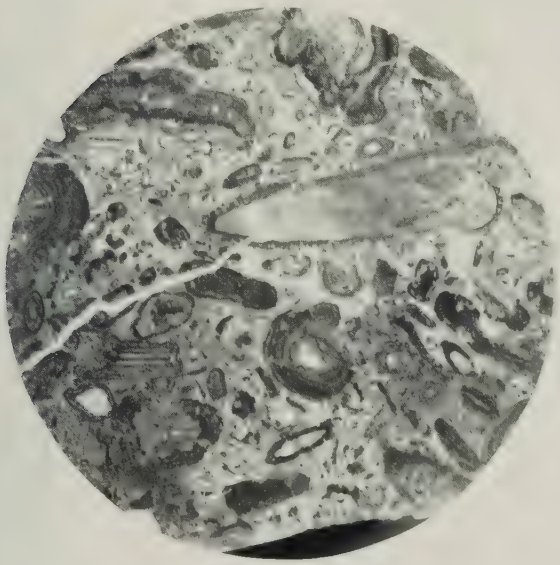


FIG. 2. Polished section of ooidal limestone. × 1

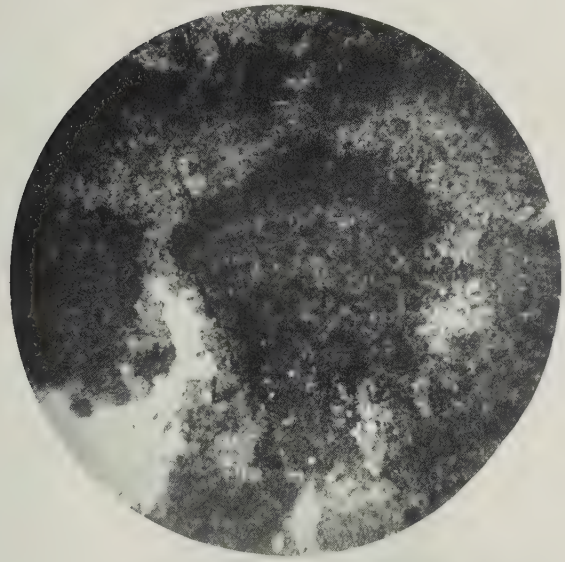


FIG. 1. Photomicrograph of a thin section of an ooid showing crystalline texture of calcite and cuspate structure of the concentric layers. × about 30

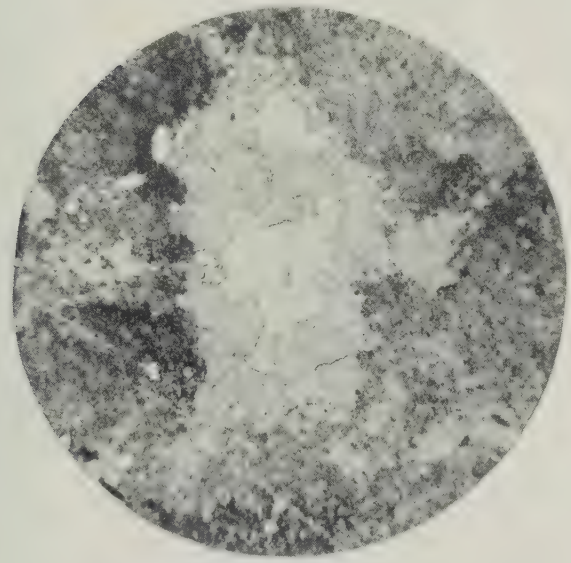


FIG. 2. Photomicrograph of a thin section of an ooid showing a radiating cavity partly filled with secondary calcite. × about 30

PLATE XXXV

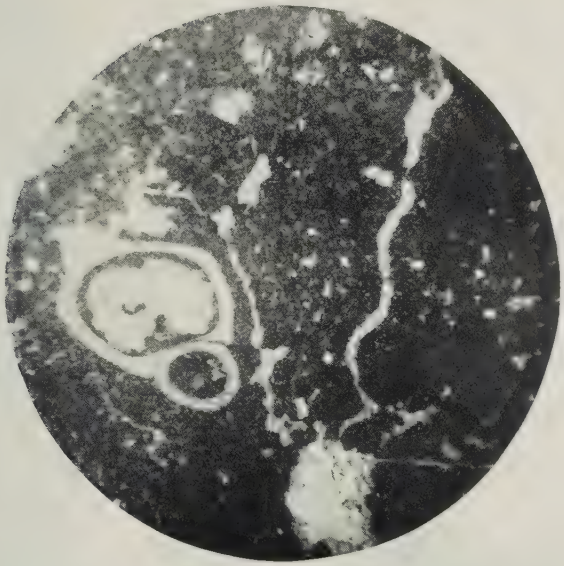


FIG. 1. Photomicrograph of a section of an ooid showing creamy white matrix. At this magnification (× 30) the crystalline texture of the matrix is not resolved

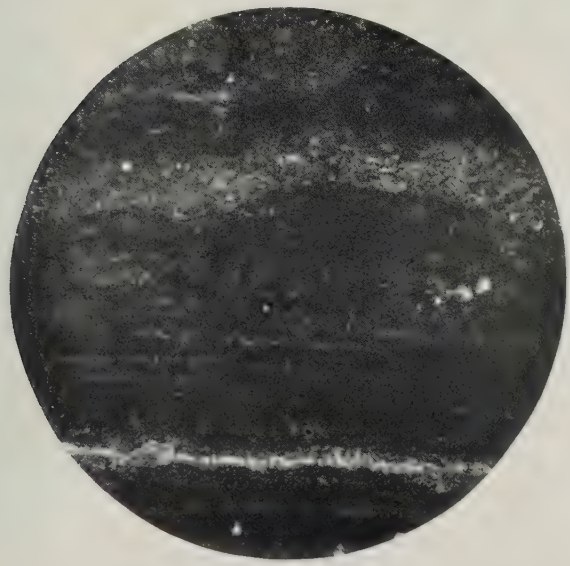


FIG. 2. Photomicrograph of a thin section of an ooid showing dense, compact layers which are, doubtfully, of algal origin

THE OCCURRENCE OF FLUORITE IN THE MONROE FORMATION OF THE MT. PLEASANT OIL POOL

PAUL E. FITZGERALD AND WILLIAM A. THOMAS

FLUORITE is unique in that it is formed under a wide range of geological conditions and occurs in all types of mineral deposits, from those whose relationships indicate that they developed at exceedingly high temperatures to those in which it is doubtful whether igneous action played any part at all in their development.

In chemical nomenclature fluorite is calcium fluoride (CaF_2), consisting of 51.1 per cent Ca and 48.9 per cent F.[1] The mineral, which is not particularly hard, falls into fourth place in Mohs' scale of hardness. It has a specific gravity of 3.1, crystallizes in the cubic system, and has well-developed octahedral cleavage. It occurs both in massive form and also in well-developed crystals, which, according to Wilson,[2] are formed where cavities are present and hence are of the low-temperature type. Its color ranges from white through yellow, green, blue, rose and violet to purple. Wilson[3] further observes that most of the fluorspar in pegmatites and other high-temperature deposits are violet or purple, whereas the more delicate hues prevail in deposits of the low-temperature type.

Fluorite is not particularly common in Michigan; it is mentioned by Rominger[4] as occurring in the Hudson River Series near the mouth of the Sturgeon River and also by Lane[5] as

[1] Wilson, M. E., *Fluorspar Deposits of Canada, Economic Geology Series*, No. 6, p. 2, 1929. [2] *Ibid.* [3] *Ibid.*

[4] Rominger, C., Vol. 1, Part III, *Geol. Surv. Mich.*, pp. 50-51, 1869-73.

[5] Lane, A. C., *Geol. Surv. Mich., Report of the State Board of Geological Survey for 1891 and 1892*, p. 176.

occurring in the Ordovician of the Upper Peninsula. Ehlers [6] found it in the Schoolcraft member of the Manistique Series. Carman [7] gives several localities for it in the northern part of the State of Ohio, notably in the Niagaran, Greenfield and Columbus formations. Here it is intermixed with celestite, which occurs in greater abundance.

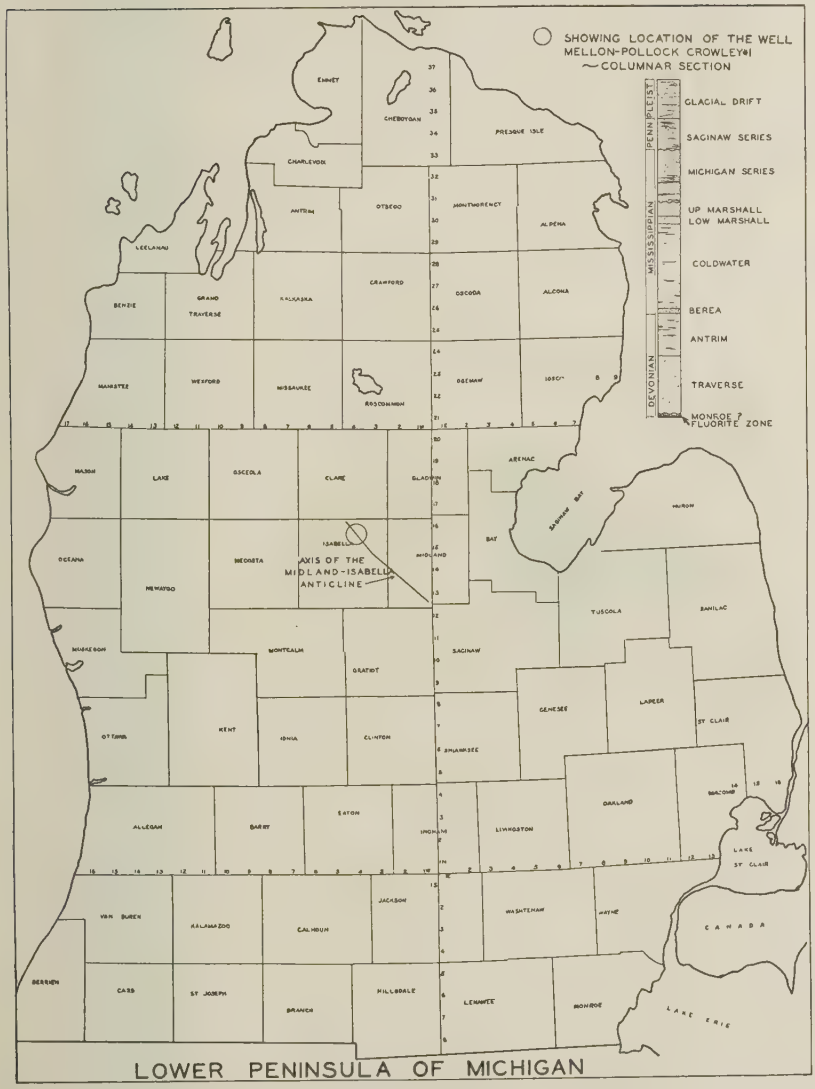
The writers' observation of the mineral is confined to two places, namely, wells drilled for oil in Isabella County approximately ten miles north of Mt. Pleasant, T. 16 N., R. 4 W. (see Map 43). Here it occurred in Mellon-Pollock Crowley No. 1 at a depth of 3,743–53 feet and in the Mellon-Pollock Durnin No. 1 at a depth of 3,766–68½ feet. In the latter well only a few fragments were identifiable.

The mineral undoubtedly occurs in some member of the Detroit River Series (Upper Monroe). It will be difficult to determine in just what part of the Upper Monroe it is found, since fossil evidence is lacking. Correlation is made more complex in this area by an erosional unconformity along which practically all of the Dundee and, in some places, a considerable part of the Upper Monroe have been removed.

The first evidence of a major unconformity on the eastern side of the state seems to appear near the Midland-Isabella structure and this structure continues westward to Muskegon, where over 450 feet of Dundee and Upper Monroe sediments have been eroded.

The deposit under discussion occurs along this well-developed unconformity and the wells from which the mineral was collected are near the axis of the Vernon Township structure, which is a continuation of the Midland-Isabella fold and is traceable for over thirty miles. Its alignment suggests that the Paleozoic sediments have been laid down upon a highly faulted pre-Cambrian floor. The present evidence for faulting is from well records in Ontario, together with the presence of large faults in the Upper Peninsula, where displacements of from 5,000 to 10,000 feet are common. These faults, whose trend indicates that they continue

[6] G. M. Ehlers, personal communication.
[7] J. Ernest Carman, personal communication.


SHOWING LOCATION OF THE WELL
MELLON-POLLOCK CROWLEY#1
~COLUMNAR SECTION
PENNSYLVANIAN
MISSISSIPPIAN
DEVONIAN
GLACIAL DRIFT
SAGINAW SERIES
MICHIGAN SERIES
UP MARSHALL
LOW MARSHALL
COLDWATER
BEREA
ANTRIM
TRAVERSE
MONROE ?
FLUORITE ZONE
AXIS OF THE
MIDLAND-ISABELLA
ANTICLINE
ISABELLA
MIDLAND
BAY
SAGINAW BAY
HURON
CANADA
LAKE ST CLAIR
LAKE ERIE
EMMET
CHEBOYGAN
PRESQUE ISLE
CHARLEVOIX
ANTRIM
OTSEGO
MONTMORENCY
ALPENA
LEELANAU
BENZIE
GRAND TRAVERSE
KALKASKA
CRAWFORD
OSCODA
ALCONA
MANISTEE
WEXFORD
MISSAUKEE
ROSCOMMON
OGEMAW
IOSCO
MASON
LAKE
OSCEOLA
CLARE
GLADWIN
ARENAC
OCEANA
NEWAYGO
MECOSTA
TUSCOLA
BANILAC
MUSKEGON
MONTCALM
GRATIOT
SAGINAW
OTTAWA
KENT
IONIA
CLINTON
GENESEE
LAPEER
ST CLAIR
SHIAWASSEE
ALLEGAN
BARRY
EATON
INGHAM
LIVINGSTON
OAKLAND
MACOMB
VAN BUREN
KALAMAZOO
CALHOUN
JACKSON
WASHTENAW
WAYNE
BERRIEN
CASS
ST JOSEPH
BRANCH
HILLSDALE
LENAWEE
MONROE
LOWER PENINSULA OF MICHIGAN

MAP 43

into the Lower Peninsula, lose their identity either in the Great Lakes or under a mantle of glacial drift. Following this line of reasoning, we must bear in mind the rather extensive deposits of fluorspar in eastern Kentucky and western Illinois, which are associated with a more or less complex system of faulting of the Paleozoic sediments; however, the meager evidence available to date precludes the postulation of faulting with reference to these deposits.

The general conception regarding the origin of the major deposits of fluorite has been that they are intimately related to intrusive masses of igneous rocks. The smaller deposits, such as those mentioned by Wilson [8] as occurring at Amherstburg and Niagara Falls, Ontario, have no apparent relation to major disturbances, nor are they derived from magmatic waters with fluorite in solution. The latter deposits were undoubtedly an original constituent of the dolomite and belong to the sedimentary type.

Regardless of the disturbances that pass near the location in the Vernon Township area, where the mineral was observed, there must be at least 4,000 feet of sediments between the basic formation and the horizon in which the deposit was found. Within this interval we have approximately 1,500 feet of salt in the Salina and Monroe formations, which would tend to seal off any upward migration of magmatic waters carrying fluorine into the Detroit River Series. One author [9] expresses the view that less than 1,000 feet of sediments is needed to constitute a barrier to the upward migration of magmatic waters.

Lack of evidence supporting the theory of igneous intrusion in the Lower Peninsula and the presence of salt in the Salina and Monroe formations precludes any direct connection between major igneous activity and the fluorspar deposits of the Lower Peninsula of Michigan.

The action of Paleozoic seas on old pre-Cambrian land masses carrying such minerals as cryolite, lepidolite and fluor-apatite may account, in part, for the fluorine in the Monroe seas. The

[8] Wilson, M. E., *op. cit.*, p. 12. 1929.
[9] Bagg, R. M., *Bull. Geol. Soc. Am.*, 22 : 396. 1918.

reworking of Paleozoic sediments that contain mineral deposits such as exist in Ontario may constitute an additional source.

With subsequent emergence and erosion, large cavities or vugs of considerable size were formed. In the Crowley No. 1 the drillers report the dropping of their tools two or three feet, thus substantiating the evidence of sizable cavities in this area.

The majority of the specimens taken from these wells were well-developed cubic crystals, which partially or totally filled the cavities. The rest consisted of a granular mass; on close examination, however, most of these were found to be crystal aggregates (see Pl. XXXVI).

The mineral has a vitreous luster, is translucent and, when granular, white. The individual grains and crystals are generally colorless, although some of them are brown and one specimen is almost black. On heating, the mineral decrepitates vigorously; no fluorescence is noted. The specimens did not effervesce when treated with dilute hydrocholoric acid. The crystals vary in size from one quarter of an inch to two inches square.

The source of color of fluorite has not been conclusively determined, although some writers [10] express the view that it may be due to contained hydrocarbons. The color of the deposit in Vernon Township may be explained in this way, since oil is found near and in the fluorite zone. To substantiate further this origin of the color, water containing hydrocarbon compounds is found contiguous to the unconformity. The color may also be due to inclusions of minute particles of dolomite within the crystals themselves. These inclusions, where observed, appear in dark-colored bands parallel to the octahedron.

In this area secondary deposits of this type are likely to be a controlling factor in the accumulation and recovery of oil, for wells drilled in it are very erratic in both production and life. Many wells on structure, offsetting commercial producers, are short-lived or dry, owing undoubtedly to the cavities being filled with secondary deposits, leaving little or no porosity for the accumulation of oil.

[10] Ulrich, E. O., and Smith, W. S. Tangier, *U. S. Geol. Surv., U. S. Prof. Paper 36*, p. 125. 1905.

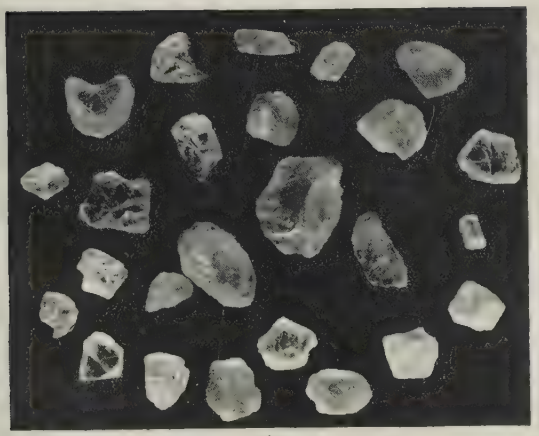
In conclusion, the writers do not believe that there is any relation between this deposit and igneous activity of any type, first, because of lack of evidence of igneous intrusions, and, secondly, because it is not likely that magmatic waters could migrate upward, on account of the several hundred feet of salt in the Salina and Monroe formations.

This deposit, which is of secondary origin, was caused by reworking of old land masses and the subsequent deposition of the mineral within cavities formed by erosion along an unconformity.

The color may be due to contained hydrocarbons and inclusions of small particles of dolomite within the crystals themselves.

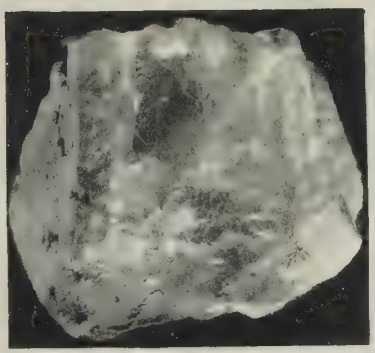
Pure Oil Company
Saginaw, Michigan

PLATE XXXVI



1

2



3

4

1. BROKEN SPECIMENS FROM CROWLEY NO.1
2. CRYSTAL SHOWING OCTAHEDRAL CLEAVAGE AND INCLUSIONS OF DOLOMITE
3. SPECIMEN WITH PETROLIFEROUS INCLUSIONS
4. FLUORITE SHOWING CRYSTAL FACES

THE THICKNESS OF THE NEWARK SERIES IN PENNSYLVANIA AND THE AGE OF THE BORDER CONGLOMERATE

DEAN B. McLAUGHLIN

THE Newark Series (Triassic) consists of three principal formations: the Stockton, a basal quartz conglomerate overlain by arkosic red and gray sandstones; the Lockatong, a rather heavy-bedded, hard black shale; and the Brunswick, a red shale with fine sandstone members. The Border Conglomerate occurs extensively along the northwestern boundary of the Triassic belt. The entire series is intruded by fine diabase in dikes and great sills, and a few extrusive sheets occur in the upper Brunswick. The total thickness of the series is generally stated as approximately 20,000 feet.

In Bulletin No. 29 of the Virginia Geological Survey, Professor J. K. Roberts treats the Virginia Triassic and proposes views of the thickness of the Newark series and of the stratigraphic position of the Border Conglomerate which differ radically from those previously accepted, as shown by the following quotation: [1]

> Various geologists in the past have argued that the Border Conglomerate at Leesburg on the western side of the basin is the youngest of the Triassic areas and the quartz phase of this conglomerate on the western margin is the oldest. Sections have been measured across the Triassic . . . and without taking into consideration the matter of faulting and the duplication of strata, there have been derived enormous thicknesses . . . reaching as much as 35,000 feet. . . . The two conglomerates on the west and east sides of the basin are not the oldest and youngest Triassic sediments at all, but are contemporaneous in age . . . . A shallow basin was filled along the sides and bottom by coarse materials close at hand and as the basin was filled up the finer materials worked toward the center. In all probability the basin did not exceed 1,000 feet in depth.

Elsewhere [2] in the same paper he allows a thickness of 2,000 feet. He considers the same conclusions valid for other Newark localities.

[1] *Bull. Va. Geol. Surv.*, 29: 76. 1928. [2] *Op. cit.*, p. 91.

With special reference to the Pennsylvania Triassic Roberts states:[3] "The Stockton is very probably the same conglomerate which occurs on both sides of the Pennsylvania basins."

The writer has studied the Triassic at numerous localities in eastern Pennsylvania and adjacent portions of New Jersey. The field evidence there appears decidedly unfavorable to Roberts' views. In the following discussion the writer has drawn freely from the literature, but practically all the localities cited have been personally observed by him.

THICKNESS OF THE NEWARK SERIES

Except where they are cut out or displaced by the recognized major faults, the Stockton and Lockatong formations exhibit very uniform width of outcrop, with uniform dip to the northwest over distances of many miles. The same thing is true of the portion of the Brunswick beneath the great Haycock diabase sill. Such uniformity is difficult to explain if the region is so extensively faulted as to cause important repetition of beds, especially since the traces of the two major faults (which cause recognized complete repetition of the series) are not parallel to the strike, but are strongly concave to the northwest and cut out the formations at both ends. These relations will be evident from an inspection of the map shown in Figure 15. If one allows a thickness of 500 feet for the Lockatong formation, at least seven faults with displacement of approximately 500 feet, or a greater number of faults of smaller displacement, would be required to explain the observed width of outcrop. These faults would have to be spaced half a mile apart and extend for twenty miles or more along the strike without deviating sufficiently from uniform displacement to bring the underlying Stockton up or the overlying Brunswick down to the present erosion surface. Such a structure is obviously absurd.

Even if the hypothetical structure discussed above were entertained as a remote possibility in the case of those belts where the dip and strike are uniform, it fails entirely in regions where recognized folding occurs. The Haycock diabase sheet begins near the Delaware River and extends southwestward in a sinu-

[3] *Op. cit.*, p. 170.

ous course for about forty miles, measured along the strike (see Figure 15). At a few places it migrates upward in the series, but for stretches of many miles the trace of its contact with the underlying Brunswick shale is strictly parallel to the strike of that

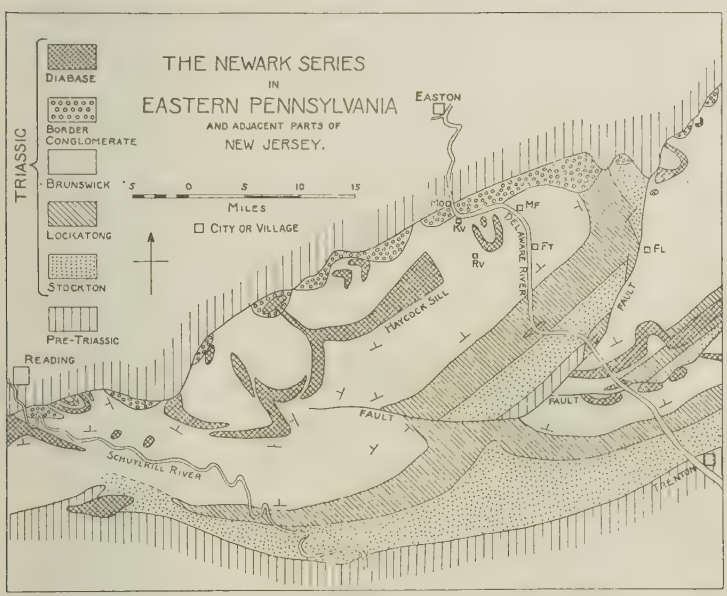


Fig. 15. Areal geology of the Newark Series in eastern Pennsylvania and adjacent part of New Jersey. Compiled from maps by the Pennsylvania Geological Survey, the New Jersey Geological Survey, the United States Geological Survey, B. S. Lyman, E. T. Wherry, and from field work by the author

Abbreviations: Fl, Flemington; Ft, Frenchtown; Kv, Kintnersville; Mf, Milford; Mo, Monroe; Rv, Revere

shale, even at a distance of three or four miles from the contact. The sinuous trace of the contact is clearly due to a succession of pitching folds, for everywhere the shale dips uniformly under the diabase from the south and east. It is inconceivable that a succession of dip-slip strike faults could follow closely the strongly curved strike of the beds involved in these pitching folds.

A few miles east of Reading (extreme left of Figure 15) the upper Brunswick has been folded into a sharp pitching syncline, producing a V-shaped outcrop of two diabase sheets. Any fault of importance would be detected here (there is some evidence of a cross-fault, but it can cause no repetition). In this syncline there is conclusive evidence of from 5,000 to 6,000 feet of red shales.

Along the Delaware River south of Frenchtown, New Jersey (Ft in Figure 15), alternation of red and black shale suggests repetition by faulting of the contact of the Lockatong and Brunswick. Though the writer has not yet positively demonstrated that the alternation at this locality is due to interbedding, he has observed extensive interbedding of red and black shales at numerous localities near the contact of the Lockatong and Brunswick, and in some places such interbedding occurs high in the Brunswick formation. The alternation of the rock types cannot, therefore, be admitted as evidence of faulting.

A well drilled at Revere, Pennsylvania[4] (Rv in Figure 15), gives clear evidence of such interbedding, as well as definite information on the lower limit of thickness of the Brunswick formation. At a depth of 2,000 feet the Lockatong formation had not yet been reached, as is shown by the fact that the lowest rocks were still red shales and sandstones with smaller thicknesses of black shale.

It is observed, in sections certainly unaffected by faulting, that the diabase intrusives have altered the shales for thicknesses of hundreds of feet. If such sheets were intruded between the beds of a series of strata only 2,000 feet thick, a large percentage of the entire surface outcrop would show alteration. The observed small areal extent of the altered rocks is, therefore, clearly in favor of the large thickness of the Newark Series.

It must be concluded that the field evidence in Pennsylvania gives no support to Roberts' view that the Newark series is only about 2,000 feet thick. The indicated thicknesses in the Delaware River section are approximately:

Brunswick (below diabase)	6,000 feet
Lockatong	3,500
Stockton	3,000+

[4] Lesley, J. P., *Proc. Am. Phil. Soc.*, 29: 21. 1891.

Farther west a thickness of over 10,000 feet is indicated above the diabase, which makes the total thickness of the series over 20,000 feet. Lyman [5] considered the thickness to be about 27,000 feet; Stose,[6] in the Fairfield-Gettysburg area, finds 20,000 feet; and similar figures are given by Kümmel [7] for New Jersey. It appears to the writer very improbable that faults now unrecognized will account for as much as 20 per cent of this apparent thickness.

AGE OF THE BORDER CONGLOMERATE

At some localities the Border Conglomerate appears to be basal; it is found in direct contact with pre-Triassic rocks. Southeast of Reading the conglomerate fills open joints in the Cambrian limestone. Several miles east of Reading the conglomerate and overlying shales, which form part of the syncline already referred to above, dip directly away from the pre-Triassic. These observations by themselves would appear to favor Roberts' view that the conglomerate is of Stockton age.

That the conglomerate near Reading is actually high up in the Newark series is shown by its relation to the Brunswick red shale. On both limbs of the syncline, just below the lower diabase sheet, conglomerate occurs inclosed by red shale which dips under the diabase. On the south limb the transition from conglomerate to shale *along the strike* is clearly observed. The change is rather abrupt, and in the absence of good exposures it might be considered evidence of faulting. Antietam Creek furnishes an excellent section of the transition phase of interbedded shale and conglomerate. There can be no doubt whatever that this body of conglomerate is of Brunswick age.[8]

In the Delaware River section the conglomerate is well exposed at Monroe, Pennsylvania (Mo in Figure 15), where it is interbedded with red shale and sandstone which undoubtedly belongs to the Brunswick formation. Two miles east of Kintnersville (Kv in Figure 15) a few thin beds of conglomerate were found by the writer

[5] *Penna. Geol. Surv., Final Rep.*, 3, Part 2, 2589. 1895.
[6] *U. S. Geol. Surv.*, Folio 225. 1929. [7] *Ibid.*, Folio 191. 1914.
[8] This locality was studied earlier by E. T. Wherry, *Trans. Wagner Free Inst. of Sci.* (Phila.), 7: 5. 1910.

in Brunswick shale beneath an outlier of the Haycock intrusive sheet. The relations are clear also on the New Jersey side of the river. A mile and a half west of Milford, New Jersey (Mf in Figure 15), an abrupt transition from red shale and sandstone to interbedded conglomerate and sandstone occurs at a deep ravine. The writer found here evidence of several faults, but in every case conglomerate occurred on both sides of the fault, so that this is not a case of downfaulting of Brunswick shale against Stockton conglomerate. The age of the conglomerate at this locality is unquestionably Brunswick.

North of Milford, New Jersey, the rock types are quite varied. Red and black shales, arkosic sandstone and quartz conglomerate are found within an area of a few acres. Fortunately, the exposures are good and the writer was able to establish the fact that these diverse rocks constitute a conformable series having the following approximate thicknesses:

Interbedded quartz conglomerate, arkosic sandstone and red shale	120+ feet
Black shale, inclosing a thick red shale member	150
Brunswick red shale	indefinite, great thickness

The same series was identified at two localities approximately three fourths of a mile apart along the strike. This group is very evidently of Brunswick age.

The writer concludes that the Border Conglomerate is for the most part of Brunswick age, and is, therefore, among the youngest of the Triassic formations. On the other hand, it lies directly upon the pre-Triassic in places, showing that the Newark series has overlapped the older rocks from southeast to northwest. The same general conclusions were reached by Wherry [9] as a result of studies near Reading and elsewhere. Stose [10] finds the Border Conglomerate the youngest Triassic formation in the Fairfield-Gettysburg area. Künmel [11] finds that, in the Raritan area (north of Flemington, New Jersey, Fl in Figure 15), not only the Brunswick, but the Stockton and Lockatong as well, pass along

[9] *Proc. Acad. Nat. Sci. Phila.*, 65 : 114. 1913. [10] *Op. cit.* [11] *Op. cit.*

the strike into Border Conglomerate. Thus, though the conglomerate is, in the main, of Brunswick age, local bodies of it may be of any age within the Newark series.

The writer is indebted to Mr. G. W. Stose and to Professors W. H. Hobbs and E. C. Case for helpful criticisms and suggestions.

University of Michigan

A PETROGRAPHIC STUDY OF THE MARSHALL FORMATION AND ITS RELATION TO THE SAND OF THE MICHIGAN SERIES FORMATION

MARGARET D. STEARNS AND CHARLES W. COOK*

DURING the month of July, 1930, a well drilled in Section 6, Grant Township, Clare County, encountered three million cubic feet of gas at a depth of 1,408 feet. Naturally this event aroused a great deal of interest in the area, especially since the pay sand indicated an abnormally high structure. The pay sand at that time was correlated as Marshall on the basis of lithological similarity. It was not long, however, before an offset well was drilled and, since it was dry, drilling was continued to the Dundee formation. This second well encountered about forty to fifty feet of shale and gypsum directly beneath the gas pay sand, clearly indicating that the sand was part of the Michigan Series formation. Similar sand conditions were encountered in Broomfield, Vernon and Isabella townships in Isabella County.

It therefore became a question of decided correlative value to discover a means of distinguishing between the sands of the Michigan Series and the Marshall formations without drilling through the whole section, since when gas was encountered the wells were shut down in the pay sand. With this idea in mind the petrographic study of the Marshall and Michigan Series was attempted.

When the work was begun only a very few data were at hand on which such a study could be based and for that reason analyses

* The authors wish to thank Mr. W. A. Thomas of the Pure Oil Company and Mr. R. B. Newcombe of the Michigan Geological Survey for their kindness in supplying the large number of samples used in the investigation.

were made first on a vertical section reaching from the base of the drift to the top of the Coldwater formation. For this purpose well cuttings from one of the core tests of the Pure Oil Company in Tuscola County were used, and an analysis was made of samples for every five feet of core, sometimes for less.

The method of analysis consisted of separating the samples on the basis of size and specific gravity, and then examining the separates with the polarizing microscope.

The process of separation followed was, in general, that which Milner recommends in his latest edition of *Sedimentary Petrography*. A few changes, however, were made. Acetylene tetrabromide was used as the heavy medium instead of bromoform, since it gave a more constant 2.9 liquid. For the first series of separations a 2.6 liquid was also employed, but the results obtained from these separations did not pay for the work involved.

Of the dry sieved sand the separate caught in the 0.25 mm. to the 0.50 mm. screen was used. At first all the sand below 0.50 mm. was examined, but this was found to be unsatisfactory because the smaller silt particles resulted in a large separate, most of the constituents of which were undeterminable by petrographic methods. The separate from between 0.25 mm. and 0.50 mm. was then compared with the separate found between 0.10 mm. and 0.25 mm. This procedure eliminated the difficulty arising from the finer-grained particles, but there proved to be a possibility of loosing some of the heavy mineral grains which were too large to pass through the 0.25 mm. screen. From comparisons made with the sample of the same depth we found that the separates from the 0.25 mm. to 0.50 mm. size gave the best mineral assemblage. This separate occasionally had the disadvantage of containing grains too thick to permit of their identification by means of polarized light, and in such cases it was necessary to break up the grains.

This complete vertical section, when separated and determined microscopically, was used as a basis for comparison with samples from widely separated areas. Well cuttings of the Marshall and Michigan Series sands from various parts of the state were secured and compared with the complete section. This comparison showed

that the formations as found in the Tuscola well are typical of all the localities studied for the whole state.

Figure 16 shows the result of the determinations made on the vertical section. Several things are worthy of note in the upper sandstone section. These sands (no attempt has been made to distinguish between the Parma and Saginaw formations) showed that the most varied assemblage of minerals, and also the least weathered surfaces of the whole section, occur in the Pennsylvanian formations. The quartz was angular to subangular and generally rutilated in parallel hairlike lines, which, according to Holmes,[1] is indicative of a granitic or related type of parent rock.

Some relationship seems to exist between the amount of rounding and the degree of turbidity in the quartz grains; that is, the more turbid the grains the more rounded they appear to be. However, since the upper sand formations were studied only from the one well, and in that case attention was directed to the heavy mineral assemblage, this relationship has been left for later investigation.

The Michigan Series was quickly recognizable, as might be expected, in the change from the sandstone of the Pennsylvanian to the shale and limestone of the Mississippian. The relatively large assemblage of heavy minerals ceases abruptly. Zircon is not found in any of the lower formations. Muscovite, having a relatively high specific gravity, also disappears. Tourmaline and hornblende occurred in only a very few slides, and in those not more than one or two grains were observed.

Above a depth of 225 feet, as shown in Figure 16, zircon is rather abundant and fairly persistent, pyrite is rare and such minerals as tourmaline, cyanite and rutile, characteristic of the Pennsylvanian sands, are present. Below a depth of 225 feet these heavy minerals are scarce and pyrite is very characteristic. Megascopically the determination at this point characterizes the formations above a depth of 225 feet as a sandy shale, those below as a coarse gray limestone and shale.

In passing downward from the Michigan Series to the Marshall formation it develops, unfortunately, that the heavy mineral

[1] Holmes, Arthur, *Petrographic Methods and Calculations*, p. 178.

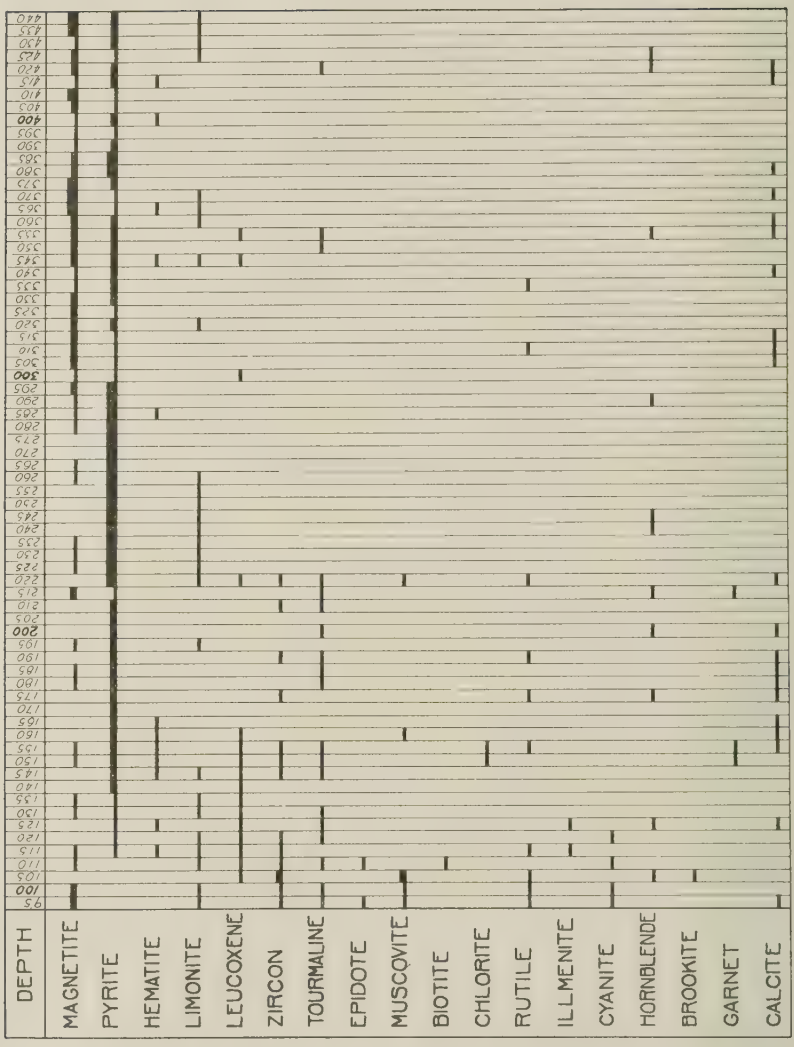


FIG. 16. Persistence chart for the Tuscola well section

assemblage of the latter is no richer than that of the Michigan Series. The change, which may be observed in the study of the vertical section, is, in general, an increase in the amount of magnetite and a decrease in the amount of calcite. It would be impossible to state definitely that the quantitative relationship of magnetite and pyrite could be used as a basis for differentiation at the present time. Quantitative data might possibly reveal something in this respect, but from the qualitative data on heavy minerals alone the sections are too similar for definite differentiation.

It is evident that if one were given a sand from an unknown depth it would be impossible to distinguish between the Michigan Series sand and the Marshall sand by means of the heavy minerals. If the complete vertical section is examined one becomes accustomed to the variations from slide to slide and can detect differences such as the amount of weathering and an increase of magnetite, which are almost impossible to describe. This, however, is not of much assistance in the problem of correlation, for if the whole section is available megascopic correlation is simpler and just as certain as a microscopic examination in this particular problem.

It follows, therefore, that the principal value of petrographic observations made on cuttings from the Marshall sandstone arises from the conclusions which may be drawn concerning the processes and conditions of deposition.

In order to ascertain definitely the relative diagnostic value of well cuttings and thin sections made from diamond drill cores, thin sections of cores from several localities were made and studied. The cores which were used for this purpose were obtained through the kindness of Mr. John Bruun of the Grayling Development Company and Mr. W. A. Thomas of the Pure Oil Company. The examination of these thin sections confirmed the conclusions which previously resulted from the study of the detrital material, and indicated clearly that the absence of heavy minerals in the separates was due to the nature of the sands and not to the methods of separation. Further, it showed that for the determination of heavy mineral content of a sand the use of thin sections has no advantage over the use of well cuttings.

The thin sections did, however, disclose some interesting facts not shown by the examination of the cuttings. In the first place, plagioclase was recognizable in the Marshall sandstone, but was not noted in the Michigan Series formation. Since the plagioclase rocks are very difficult to determine in detrital material, owing to the resulting products of decomposition, this was indeed an addition to our knowledge. Furthermore, the presence of plagioclase furnished very good evidence that the lack of heavy minerals was due to the absence of such minerals in the parent rock, for the plagioclase rocks alter much more rapidly than do zircon, garnet and such minerals. We may conclude, therefore, that, if the latter minerals had been present with the plagioclase in the original rock, they would certainly be present in the sand.

Further, the absence of heavy minerals cannot be explained on the basis of selective deposition, since the plagioclase was found in areas as widely separated as Sanilac and Roscommon counties. It does not seem plausible that both areas would have been receiving only material of light specific gravity indicative of the deeper part of the basin at the same period.

The plagioclase was determined to be of the more acid type — oligoclase to albite — and it occurs in both the Upper and Lower Marshall formations. It is, however, much more prominent in the former than in the latter.

Sericitization was prominent in the interstitial material of the core from Roscommon County and was present in the Lower Marshall core from Sanilac County. This indicates not that the deposition of the sand took place under conditions which were favorable to decomposition, but rather that later cementation by waters carrying carbon dioxide occurred. Much of the interstitial material is also calcite.

Both the quartz and plagioclase are angular to slightly subangular, with rather large grains, indicating that the haul had been of comparatively short duration and had not been allowed sufficient time for decomposition and rounding.

The question of the source of the pyrite and magnetite of the Michigan Series and Marshall formations previously mentioned and the conditions of deposition which gave rise to their associa-

tion in the Marshall formation require consideration. From Figure 16 it seems evident that pyrite is characteristic of the Michigan Series, whereas both pyrite and magnetite occur in relatively equal abundance in the Marshall. A study of the pyrite and magnetite of the Marshall formation reveals the fact that the two are often intergrown. Some grains of magnetite show perfect pyrite crystals superimposed on the surface of the former mineral. The following hypothesis is an attempt to account for the conditions which have resulted in this type of deposition.

If the iron had been carried into the basin of the Michigan Series sea in the form of a sulphide, precipitation could have taken place simply by evaporation, loss of pressure or reduction of temperature. Since Michigan Series time was a period in which gypsum was being deposited, evaporite conditions are indicated and would be the easiest explanation for the deposition of the iron sulphide. The presence of hydrogen sulphide would also induce precipitation of the pyrite. There is plausible evidence that organic matter existed in the presence of the limestone of the formation. The organic matter might have acted as a source of hydrogen sulphide, or as a direct reducing agent to precipitate the sulphide from the sulphate form.

According to Lane,[2] the brines of the Michigan Series formation are strongly sulphate and carry large amounts of calcium and magnesium. Since the waters are sulphate in nature and since the pyrite crystals are small, fresh and widely disseminated, often showing close association with the quartz crystals, it seems more plausible that deposition took place from the ground waters subsequently to the deposition of the Michigan Series formation, and that the reducing agent which caused the precipitation of the sulphide from the sulphate solution was probably hydrogen sulphide.

To account for the precipitation of both pyrite and magnetite in the Marshall formation, consideration must be given to the fact that conditions of deposition of the iron minerals must have been different in this case. Two important factors may have accounted for the change. The waters of the Marshall formation

[2] Lane, A. C., *Geol. Surv. Mich., Ann. Rep. for 1908*, p. 83.

are strongly chloride and carry large amounts of sodium and calcium. The lack of organic matter would suggest that reducing conditions were also absent. Thus it follows that the Michigan Series formation usually contains a sulphate brine and the Marshall formation contains a chloride brine. The mingling of these two contrasting solutions is sufficient cause for the simultaneous precipitation of the iron sulphide and the iron oxide. Van Hise [3] gives the following equations to account for the close association of pyrite and magnetite:

$$22\,FeSO_4 + 20\,H_2O = FeS_2 + 7\,Fe_3O_4 + 20\,H_2SO_4$$

or

$$3\,FeS_2 + 4\,H_2O + 4O = Fe_3O_4 + 4H_2S + 2SO_2$$

Regarding the first equation, he says that, though it has not been proved in the chemical laboratory, there is much geological evidence in its favor. It appears to be the best explanation for the conditions found in the Marshall sandstone.

The possibility that pyrite is a replacement product from the magnetite was considered. Van Hise, however, gives no evidence for such a reaction. Clark [4] records Deolter's experiment in which pyrite was formed in the laboratory by heating magnetite with hydrogen sulphide and water to temperatures of 80 to 90 degrees Centigrade for 72 hours. These temperatures are too high for near-surface conditions, and in addition the magnetite does not appear to be more greatly altered than the pyrite. When the slide shows that alteration has taken place, both minerals are affected. If the pyrite were a replacement deposit, the magnetite should show much more alteration than the pyrite.

Van Hise does state that pyrite may be derived from hematite, but the quantity of hematite in it is very minor as compared with the amount of magnetite, and the pyrite does not show any definite relationship to the former mineral.

It thus seems that the best explanation of the association of magnetite and pyrite in the Marshall formation is that it is due to reactions which took place as a result of the mingling of the sul-

[3] Van Hise, C. R., *U. S. Geol. Surv., Monograph 47*, pp. 1108–1117.
[4] Clark, F. W., *U. S. Geol. Surv., Bull. 770*, p. 337.

phate waters from the Michigan Series and the chloride waters from the Marshall formation.

In conclusion the following points may be summarized:

1. The heavy minerals of the Marshall and Michigan Series formations do not furnish a means of distinguishing between the two sands.
2. No marked variation of the mineral assemblage is shown in samples from widely separated areas. Both formations appear to be typically barren of heavy minerals throughout their geographical extensions.
3. The presence of plagioclase feldspar indicates that heavy minerals are lacking, owing to their absence in the parent rock.
4. The magnetite and pyrite of the Marshall and Michigan Series formations are secondary in origin. In the former the two minerals are related and their deposition is the result of the same reaction. In the latter the abundant pyrite is the result of the action of reducing conditions on sulphate waters.

University of Michigan

COUNTY GOVERNMENT IN MICHIGAN

ARTHUR W. BROMAGE

THE institutional structure of local government in Michigan is the product of a pragmatic historical development. The existing political entities of county, township and village are sadly out of joint with modern times. They were devised to suit the needs and temper of the early nineteenth century, and are as antiquated in the twentieth as the pony express and the horse-drawn street-car. The historical development of these institutions merits the attention of every one who would understand their place in the automobile age.

Political philosophers of past and present have insisted upon the importance of a strong system of local self-government. The township has been lauded not only as essential to the welfare of the state, but as an institution that arises out of nature itself. In commenting upon New England's system of town government Alexis de Tocqueville said: "The village or township is the only association which is so perfectly natural, that wherever a number of men are collected, it seems to constitute itself." [1]

Jefferson likewise was a great exponent of township government. "The article, however, nearest my heart," he wrote with obvious emphasis, "is the division of counties into wards [townships]. These will be pure and elementary republics, compose the state, and will make of the whole a true Democracy as to the business of the wards, which is that of nearest and daily concern." [2]

HISTORICAL DEVELOPMENTS

The draft of an ordinance for ascertaining the mode of locating and disposing of lands in the western territory was reported to the

[1] De Tocqueville, Alexis, *Democracy in America*, Henry Reeve, translator (3d edition, 1839), p. 55.

[2] *The Writings of Thomas Jefferson* (edited by H. A. Washington), 7: 35. This principle was expressed in a letter to Samuel Kercheval, Sept. 5, 1816.

Congress of the Confederation in 1784 by Jefferson. This proposed that the land "be divided into hundreds [townships] of ten geographical miles square." [3] The Congress, however, took no final vote upon this subject until 1785. The ordinance of that year decreed that "the surveyors . . . proceed to divide the said territory into townships of six miles square. . . ." [4] The significance of this act in laying the cornerstone of the institutional structure of local government in the Northwest can hardly be exaggerated. A basic social and political organism was created by law. As George E. Howard has stated the case: "Everywhere in the Northwest Territory and in the vast regions beyond the Mississippi and the Missouri, the government surveyor, even in advance of the pioneer, has laid the first foundation of local institutions. . . . Manifestly, the 'congressional' township, though as such absolutely devoid of organization, is nevertheless a municipal body in embryo requiring but slight encouragement to develop into a living body." [5]

Nor was the Ordinance of 1785 the only one of that period which helped to mold the local institutions of the Northwest. The Ordinance of 1787 contained this section: "Previous to the organization of the general assembly the governor shall appoint such magistrates, and other civil officers, in each county or township, as he shall find necessary for the preservation of the peace and good order of the same." [6] This was another link in the chain of acts which brought the township-county system to the Northwest.

The actual beginning of the township-county system under local control, which is still extant in Michigan today, can be traced to the Act of Congress in 1825. The latter stipulated: "That the governor and legislative council of the territory of Michigan be, and they are hereby, authorized to divide the said territory into townships, and incorporate the same, or any part thereof; to grant, define and regulate the privileges thereof, and

[3] Ford, P. L., *The Writings of Thomas Jefferson* (1894), 3 : 474.

[4] *Journals of Congress*, 4 : 520; Act of May 20, 1785.

[5] Howard, G. E., *Local Constitutional History of the United States* (1889), p. 140.

[6] *Journals of Congress*, 4 : 752; Act of July 13, 1787.

to provide by law for the election of all such township and corporation officers, as may be designated within the same." [7]

Two years later the Legislative Council of the Territory of Michigan defined the duties and privileges of townships. It provided for township meetings on the first Monday of April in every year.[8] A system of township representation in county government was established. It was enacted: "That the supervisors of the several townships, in each of the several counties of this Territory, shall annually, on the third Mondays of January, April, July and October meet together at the court house . . . and examine, settle, and allow, all accounts chargeable against such county, and ascertain what sum ought to be raised for the payment thereof, and for defraying the public and contingent expenses of such county." [9] It is fair to say that these acts of 1825 and 1827 forged the present system of rural local government in Michigan with its principles of local self-government, long ballot, decentralized administrative structure and ward representation on county boards of supervisors.

COUNTY BOARDS OF SUPERVISORS

In 1931, after the lapse of more than a century, rural local government in Michigan still has as its basic element the township. Moreover, one of the dominant features of modern county government in the state is the system of township representation on county boards. This is firmly embedded in Article VIII of the constitution, which requires that: "A board of supervisors consisting of one from each organized township, shall be established in each county, with such powers as shall be prescribed by law. Cities shall have such representation in the boards of supervisors of the counties in which they are situated as may be provided by law." [10]

In the industrial counties of southern Michigan, the system of representation of townships and cities on county boards creates a

[7] *U. S. Statutes at Large*, 4: 80; Act of Feb. 5, 1825.
[8] Mich., *Territorial Laws*, 2: 317; Act of March 30, 1827.
[9] *Ibid.*, 2: 325; Act of March 30, 1827.
[10] Mich., *Const.*, Art. 8, Sec. 7.

sorry situation. The inevitable result is a county board of considerable size. In 1930 Bay County had 39 supervisors; Genesee, 37; Ingham, 30; Jackson, 27; Kalamazoo, 22; Kent, 52; Muskegon, 33; and Oakland, 45.[11] These miniature legislatures are not suited to handle problems of modern county government. The city of Detroit has a council of 9 members; it takes 125 supervisors to make up the board of Wayne County. Many cities of Michigan have reduced the size of their councils and instituted the plan of electing them at large. On the contrary, the size of county boards has, if anything, noticeably increased; the principle of ward election by townships and cities has remained.

Such a plan of representation might be arguable if the county boards were constantly enacting fundamental political axioms into law. The facts are otherwise. The county supervisors deal with problems of an administrative and technical nature. These large, unwieldy boards have become like the proverbial millstone upon the shoulders of the taxpayer. A convention of rural and urban supervisors is not the best vehicle for the settlement of such issues as the establishment of county health units, the road program, the rehabilitation of the sheriff's organization to meet modern criminal conditions, to cite only a few of the accumulating complexities of county administration. Nevertheless, this system is the one ordained by the Michigan constitution in 1931.

Michigan's ancient system of representing Jefferson's ward republic, the township, in the county board of supervisors creates another problem. The outcome is the division of the board into urban and rural blocs. This, in my judgment, is even more unfortunate than the over-representation of the rural areas on the board. Undeniably, there is a rotten borough system in Michigan county government. Only a few examples will suffice. In 1930 Lyndon Township in Washtenaw County had 449 residents. Under the state constitution the township was entitled to one supervisor and the ratio of representation was obviously one supervisor to 449 inhabitants. By the law of 1923, which lays down the representation of cities, Ann Arbor would be entitled to six supervisors. In 1930 Ann Arbor had 26,944 residents. The

[11] From the official lists of officers in the respective counties.

ratio of representation under the law of 1923 would, therefore, be one supervisor to every 4,490 inhabitants.[12]

Yet for the county as a whole the situation differs only in degree. In 1930 the populations of Ann Arbor and Ypsilanti were 26,944 and 10,143, respectively. This urban group of 37,087 had nine supervisors. The twenty townships with a total population of 28,443 had twenty supervisors.[13] The general situation throughout the state has been tersely stated by the Michigan Municipal League: "Frequently there are townships of less than 1,000 population, each having a representative on the county board, in the same county with cities which, for the large portion of their population, have one representative for each 10,000 people." [14]

Now no one expects representation to be in perfect numerical proportion to population. There is something to be said for the representation of land as well as people on county boards. Moreover, the rotten borough system of representation has been one of our heritages from English history. We have endured it in the Congress of the United States, in our state legislatures, in our county boards and in our municipal councils. It is not even an Anglo-Saxon political axiom. The French Electoral Law of 1927 has a similar disparity [15] between the ratios of representation in the various districts. It is an old political trick; how old who knows? The shoe pinches none the less.

The most disastrous effect of this system of ward representation is the clash of urban and rural forces on the boards of supervisors. Too many issues precipitate such an alignment with serious results for the interests of the county as a whole. No one would argue

[12] Mich., *Public Acts* (1923), No. 170, provides that cities of 25,000 to 35,000 shall have six supervisors. Ann Arbor, as a matter of fact, has seven, one for each ward, by the terms of a special charter granted before the home rule amendment of 1908. This is still controlling, since the law of 1923 states "that wherever the representation of cities upon the board of supervisors of the county has been fixed by law it shall remain as now fixed until changed by charter provision. . . ."

[13] The population statistics are from the Fifteenth Census of the United States, *Population Bulletin (Michigan)*, p. 24.

[14] Editorial, *Michigan Municipal Review*, 3 (1930) : 164.

[15] Sharp, W. R., "The New French Electoral Law and the Elections of 1928," *American Political Science Review*, 22 (1928) : 684.

that the solution is a new law granting more supervisors to cities, so that urban majorities on county boards would be the rule in urban counties. That would continue the struggle with the urban groups having the upper hand. A more constructive program would be a constitutional amendment creating for each county a board of five or seven supervisors, elected at large or from large districts. This would be in line with modern practice in municipal government. Local rural government has much to learn from local urban government.

ELECTIVE COUNTY OFFICIALS

County government in Michigan is equally behind the times with respect to its administrative structure. Michigan has been one of the leading states in the development of the city manager form of government. The urban centers have come more and more to concentrate the responsibility for administrative departments under a manager or mayor. The relationship of the legislative council to the administrative agencies has been carefully articulated, particularly in the manager cities.[16]

Even the villages have joined in the movement under their home rule powers. Nor can one survey only those home rule villages with manager charters. Villages which continue to operate under the general law have demonstrated a decided tendency toward consolidation of responsibility in administrative officers. A survey of all the villages in the state in 1930 by the Michigan Municipal League revealed that there were "241 village officials serving in from two to five positions, covering almost every possible combination of offices. . . . Many villages have found it decidedly to their advantage to appoint one man to several or all of the positions which are outdoor, mechanical or manual in their nature. The combination of marshal and street commissioner is most common. Ordinarily the marshal can defend the peace of the village as handily while doing street work as he can while standing idly on the street corner." [17]

[16] For a list of manager municipalities and villages in Michigan see *City Manager Yearbook* (1931), pp. 274–275.

[17] Editorial, "Village Government More Responsible," *Mich. Mun. Rev.*, 3 (1930): 161.

In some villages the clerk is entrusted with large powers by direction of the council; in others the president takes over the work of general manager. "The important point . . . is that . . . in each of these cases the general management of municipal affairs is given to or assumed by one individual, who thereby becomes chiefly responsible for the village government whether he is legally so or not." [18]

Whereas Michigan cities and villages have moved steadily toward the integration of administrative authority within the last two decades, her counties have made no progress in this direction. They could do little even if they would. The state constitution decrees that there shall be elected biennially in each organized county "a sheriff, a county clerk, a county treasurer, a register of deeds and a prosecuting attorney." [19]

This provision is based squarely upon the principles of local rural government set up by the Congressional Act of 1825 and incorporated in the Territorial Law of 1825. Congress decreed in 1825 as to the territory of Michigan: "That all county officers within said territory shall be hereafter elected by the qualified electors residing in each county, at such time and place, and in such manner, as the said governor and legislative council may from time to time direct." [20] Pursuant thereto, the legislative council of the Territory then provided: "That county commissioners, treasurers, coroners, and constables shall be hereafter elected by the qualified electors of the respective counties. . . ." [21]

This basic method of setting up the administrative mechanism of the county has remained entrenched for more than one hundred years. Moreover, the elective principle has been extended with the growth of county officers. In this decade of the twentieth century the electorate of a typical Michigan county must select a judge of probate, a county surveyor and drain commissioner, a county school commissioner, coroners, and circuit court commissioners as well as those already enumerated. Most counties impose the additional burden on their voters of choosing a board

[18] *Ibid.*
[19] Mich., *Const.*, Art. 8, Sec. 3.
[20] *U. S. Statutes*, 4: 80; Act of Feb. 5, 1825.
[21] Mich., *Territorial Laws*, 2: 279; Act of April 21, 1825.

of county road commissioners. The straw for the camel's back in some of the counties is the popular election of a board of auditors.

So it develops that on every other September the primary campaigns for nomination on the party ticket wax warm in the eighty-three counties of the state. The local newspapers swarm with political announcements such as the following: "I wish to announce my candidacy for sheriff . . . on the Republican ticket. . . . In doing so I wish to call the attention of the voters to my qualifications and right to the office. I was born . . . in 1884 and when about 20 years of age I settled on my present farm . . . where I have resided since, improving my farm lands. I pay approximately $375 annually in taxes . . . and believe in the future possibilities and the present high agricultural standards now maintained in the county. Believing I am qualified to fulfill the duties of the office of sheriff . . . and that public business could be handled in the same efficient manner as I have my own, I most respectfully solicit your support. . . ." This is somewhat longer than the usual platform declaration. It reveals, however, the relative absence of issues in these campaigns for county office. A more common type of declaration is this one: "Being urged by my friends I have consented to enter the race for the nomination for county treasurer on the Republican ticket." Here is another typical declaration: "Would like to be your candidate for Register of Deeds on the Republican ticket and respectfully solicit your support at the Primaries. . . ." [22]

This scramble for county offices is the normal outcome of the present constitutional provisions. The Jacksonian principles are still paramount in Michigan's county government. The constitution rules that the administrative officials of the county must receive a direct mandate from the people. The time is passing in county government when any man can govern. Under the present system almost "any man" may make the run for office, and almost "any man" may be elected.

[22] Literally thousands of similar announcements appear in the Michigan newspapers prior to the biennial primary.

POPULATION TRENDS

The governmental mechanism of Michigan counties as it stands in 1931 is archaic. The same thing might be said of the system of county boundaries. Michigan's population in 1930 was 4,842,325, or an increase of 1,173,913 over the census of 1920. Although the state as a whole enjoyed a population increase of thirty-two per cent, forty-six of the eighty-three counties suffered a loss during the decade from 1920 to 1930. The most phenomenal reductions were in the northern counties and the most extraordinary gains were in the southern industrial counties. The eighty-three counties of the state show an unusual range in density of population. Oscoda County had only 1,728 inhabitants in 1930; Wayne had 1,888,946. The density of population in Oscoda was three to the square mile; in Wayne, 3,046.7 to the square mile.[23]

The nadir of population is present in the northeastern portion of the Lower Peninsula. Five contiguous counties lie athwart this region, their total inhabitants numbering only 13,493. These are Oscoda, Crawford, Montmorency, Kalkaska and Roscommon. Four of these counties dwindled in population from 1920 to 1930. The population of Crawford shrank by 23.5 per cent. Kalkaska suffered a loss of 31.9 per cent; Montmorency, 31.2 per cent; and Oscoda, 3.1 per cent. Roscommon grew 1.1 per cent, but not sufficiently to arouse speculative interest in the future of the county.[24]

In Roscommon County the inhabitants are scattered among the ten townships as follows: Backus, 15; Denton, 165; Gerrish 259; Higgins, 460; Lake, 93; Lyon, 46; Markey, 125; Nester, 83; Richfield, 281; Roscommon, 528. Roscommon village has 412.[25] It is in a region such as this that Michigan's cumbersome mechanism of township-county government, which has come down through the past century without material modification, approaches a *reductio ad absurdum*. Here are the ward republics which were so near to the heart of Thomas Jefferson. They may be as he claimed, "pure and elementary republics," but they are also poor and antiquated. Certainly such struggling townships

[23] Fifteenth Census, *op. cit.*, pp. 7–8. [24] *Ibid.* [25] *Ibid.*, p. 22.

are not so perfectly natural as to constitute themselves. They are the unfortunate results, as are so many other twentieth century ills, of legislative action.

Contrast the situation in Roscommon County with the estimate of C. J. Galpin, of the Bureau of Agricultural Economics, that a community of one thousand rural families is necessary to provide a property basis for modern community enterprise. Only in such a combined population is there an adequate basis for the support of modern schools, parks, libraries, fire departments and other services. "A small community," in the language of Mr. Galpin, "pinches its children, as a tight shoe pinches the foot. A small community today is decidedly grotesque, too, like a tiny hat on a big man." [26]

In this respect, there is an interesting contrast between the vitality of the New England town and the Michigan township. The New England town is, after all, more nearly a rural municipality. The central village or settlement of the New England town is an organic part of the town itself. It is the vital center of the rural region. Moreover, the New England town is the product of actual development. Granted that the adjustment is not perfect, the political entity in New England is built upon the firm foundation of an economic and sociological community.

As much cannot be said for the "congressional township" of Michigan. The practice has been to set up incorporated villages within the townships. These villages go a long way in solving the problems of the actual communities. Unfortunately, they leave the townships as nothing more than a region of farms with a political mechanism which they must struggle to support.

FIFTH-CLASS CITIES AND TOWNSHIPS

Of late a new factor has risen to endanger the status of the township in Michigan. The Home Rule Act provides that villages of 750 to 2,000 population may incorporate as fifth-class cities.[27]

[26] This statement was made in a radio address before the American Country Life Association and quoted in the *National Municipal Review*, 20 (1931): 3.

[27] Mich., *Compiled Laws* (1929), Vol. 1, Sec. 2243: "Any incorporated village having a population of more than seven hundred fifty and less than

Once incorporated as a city these small communities, unlike the villages, are then free from township taxation. The real economic and sociological community center is thereby bodily lifted from the fabric of the township. The remaining rural area is pitiful to behold.

Let me give a few examples. Brighton in Livingston County was formerly a village and as such subject to taxation in Brighton Township. In 1928 Brighton became a fifth-class city, free from township taxation and entitled to its own representation on the county board of supervisors. The 1930 statistics show that Brighton city has 1,287 inhabitants, whereas only 654 people are left in the rural section, which must carry on township government.[28] Truly, the fifth-class city movement, if carried to an extreme, will undermine the township. In Berrien County the village of Watervliet has likewise become a fifth-class city. In this instance the city has a population of 1,207 and 948 remain in Watervliet Township.[29]

One of the most interesting examples of this development is that of Saline village in Washtenaw County. Saline lies athwart four townships; its population grew around their intersection. As a result, the 1930 census revealed that Saline village had 124 of its inhabitants in Lodi Township and subject to Lodi Township taxes; 71 in Pittsfield Township; 779 in Saline Township, and 25 in York Township.[30] Not only were the people in the village subject to four different township tax rates, but in township elections they voted in four different localities.

Saline struck a blow for freedom in 1931 and became a fifth-class city. With the assistance of the Michigan Municipal League an excellent fifth-class city charter was drafted. The people were

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two thousand inhabitants, or any territory containing a population of more than seven hundred fifty and less than two thousand inhabitants and an average of not less than five hundred inhabitants per square mile may incorporate under the provisions of this act as cities of the fifth class. Such cities shall constitute but one voting precinct and the mayor thereof, or whenever provided by resolution of the legislative body of any such city, the city attorney, shall represent the city on the board of supervisors of the county."

[28] Fifteenth Census, *op. cit.*, p. 17. [29] *Ibid.*, p. 10. [30] *Ibid.*, p. 24.

freed from township taxation, from township officials. In addition, Saline gained her own supervisor on the county board, and will probably enjoy a reduction in costs of government through the increased efficiency of her fifth-class city government. This is all very well for Saline. No one blames the inhabitants of the village for seizing upon the advantages of the fifth-class city law. The other side of the picture is that Saline Township, whose population totaled only 1,649 in 1930, was reduced by 779 in 1931.

At the present writing (March, 1931), there are eleven fifth-class cities in Michigan. Officials of the Michigan Municipal League believe that a fifth-class city movement is now under way in some fifteen additional villages, and that approximately sixty villages are examining the possibility of a change. Should a fifth-class city movement sweep the state, it would constitute one of the few remaining nails for the already well-studded coffin of township government.

CONCLUSION

Michigan continues her township-county system of government in a period when many states are gradually eliminating the township. Michigan is one of the four remaining states to retain township representation on county boards of supervisors.[31] In Missouri only 24 of the 114 counties are organized into townships. Nebraska has organized townships in only 27 of its 93 counties. Even Illinois has 16 counties in the southern half of the state without township organization. North Dakota and South Dakota have many townships which are used only as school districts. Oklahoma has made it legally possible to abolish the township officials in approximately two thirds of the counties of the state.[32] These ever widening fissures in the once solid wall of midwestern township organization point to the day when the flood waters of reform in local rural government will sweep out of existence such relics of an American age that is forever past.

Michigan suffers in 1931 not only from the plethora of townships which it is her lot to support, but also from an oversupply of

[31] These are Michigan, New York, Wisconsin and Illinois. Cf. Fairlie, John A., and Kneier, Charles M., *County Government and Administration* (1930), p. 111.

[32] *Ibid.*, pp. 451–452.

counties. Judge Lacy made a study in 1930 of a block of nine contiguous counties in the northeastern part of the Southern Peninsula. He found that these counties had a total population of only 47,031 and an assessed valuation of $31,585,890. This region had to support nine complete county governments as well as 93 townships, 14 cities and villages, and several hundred school districts. The people were delinquent to the extent of $435,531 out of total state and local tax levies of $1,290,000 in 1928.[33]

The plain facts of the 1931 situation are that Michigan counties are not based upon economic and sociological regions. Their system of government, an inheritance from the past, has become decidedly archaic in the twentieth century.

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[33] These findings by Judge A. J. Lacy, chairman of the Property Owner's Division of the National Association of Real Estate Boards, were published in his authentic pamphlet, *The Costs of Government* (privately printed, 1930).

ISSUES INVOLVED IN THE MOVEMENT FOR CONCILIATION, 1860–61

DWIGHT L. DUMOND

THE election of Lincoln to the presidency, November 6, 1860, marked the beginning of active measures for a dissolution of the Union. American statesmanship was confronted with the task of restoring to normalcy a nation absolutely split asunder over the question of the rights of slavery under the constitution. Efforts were made to preserve the Union by securing definitive amendments to the fundamental law in the usual way or through the medium of a national convention. Finally, pacifists sought to avert hostilities until a returning spirit of confidence might operate to reconstruct a new Union. Conciliation was a possibility until the conflict at Fort Sumter, April 12, 1861.

Historians, in the main, have centered their attention upon the struggle in Congress over the Crittenden Amendments and the demand for a national convention, overlooking certain important aspects of the crisis. The most interesting phase of the whole controversy, but the least important from the standpoint of material interests, was the question of slavery in the territories. As a speculative idea upon moral principles and the theoretical ideal of state equality, it had no limitations. It looms large in the presidential canvass and in the ensuing efforts at compromise. The Southerners, Breckinridge Democrats and Constitutional Unionists alike, asserted the right of slaveholders to enter the territories with their slaves and to be protected in the enjoyment of their property by the federal government. The Republicans insisted upon the exclusion of slavery from the territories by congressional legislation. The proposal to restore the Missouri Compromise line in the then existing territories was the most discussed item of the Crittenden Amendments, and was the only proposal which ever had the remotest chance of being adopted.

There is no mystery, however, in the refusal of both sides to yield the point, though there were fewer than fifty slaves in the territories. There were Southerners who believed that slavery would expand to the territories if afforded legislative protection.[1] The idea that soil and climate had settled the question beyond the power of human efforts to alter is fallacious. No amount of legislation would extend the institution to regions where unfavorable climatic conditions prevailed. The opposite thesis, that slavery would expand into regions favorable to it without the same protection that other property had, is not true. Its circumscription, together with continued sales from the upper South, would tend to Africanize the lower South. Those who anticipated a day of ultimate emancipation knew that such a policy would magnify the difficulty of solving the social and economic problems involved.[2] Not all Southerners, by any means, believed that slavery was heaven-born and should be increased. They did refuse to concede that expansion was an evil in itself or that its circumscription would elevate the condition of the slaves; and they feared that further concentration would overwhelm the lower South with a slave, or free, negro population.

There were Northerners who believed that the freedom of expansion to the territories would lead to a demand for the reopening of the African slave trade.[3] They regarded all Southerners as devotees of the positive good argument and as determined to erect a vast slave empire upon the ruins of the federal Union. But the great majority of men, in both North and South, were discussing the problem of protection versus exclusion with respect to slavery in the territories, and were thinking of security versus abolition of slavery within the limits of the states.

At the basis of this apparently innocent matter of expediency was the vital issue of whether slaves were property on an equality

[1] *The Charleston Mercury*, Feb. 28, 1860; *Richmond Whig and Public Advertiser*, March 19, 1860.

[2] *Constitutional Rights. Speech of the Hon. William L. Yancey, at Wieting Hall, Syracuse, N. Y., Oct. 15, 1860* (Syracuse, 1860), pp. 2–3.

[3] *Disunion and Slavery. A Series of Letters to Hon. W. L. Yancey, of Alabama, by Henry J. Raymond, of New York* (New York, 1860), pp. 11–12.

with other property, based in the common law, and entitled to protection by governmental agencies within the limits of their jurisdiction; or whether slavery was dependent upon legislative enactment for its existence. The security of slave property in the District of Columbia, in the dockyards and arsenals, on the high seas, in transit through the northern states, and the interstate slave trade rested upon that very point.

The Southerners were firm in their conviction that the Republicans were seeking to establish a principle, by the exclusion of slavery from the territories, which would enable them to launch an indirect attack upon slavery as an institution within the states, and they insisted upon having the question settled once and forever.[4] They did not believe that antislavery agitation would die out; that the Northern people would cease to war upon the institution; but rather, that the elevation of the Republican party to power would energize the crusade. They believed that the protecting mantles of legality and constitutionality would shield the movement; and that the institution of slavery would be undermined and ultimately destroyed by methods more orderly, but withal, more deadly and certain, because insidious.[5]

[4] "To exclude slavery from the Territories? That is but the entering wedge. When that is accomplished, and slavery is hemmed in on all sides, and anti-slavery sentiment is established . . . the fugitive slave law, already nullified, will be repealed; slavery will be abolished in the District of Columbia; the Inter-State slave trade will be prohibited; and either by 'unfriendly legislation,' or direct action, slavery will be driven from the South. . . . This is the meaning of Lincoln's and Seward's 'Irrepressible Conflict'." — *The Daily Courier*, Louisville, Oct. 12, 1860. "You do not pretend to enter into our States to kill or destroy our institutions by force. Oh, No! You imitate the faith of Rhadamistus: you propose simply to close us in an embrace that will suffocate us. You do not propose to fell the tree; you promised not. You merely propose to girdle it, that it dies." — Benjamin, remarks in the Senate, *Cong. Globe*, 36 Cong., 2 Sess., I, 217. See also Hale to Magoffin, Dec. 27, 1860, in Smith, *The History and Debates of the Convention of the People of Alabama . . . 1861* (Montgomery, 1861), pp. 382–383.

[5] "Their bond of Union, their weapons of defense, their tenure of political power and social position are all summed up in one intelligible, practical policy — it is to make this government an agent to repress and extinguish African Slavery." — *Richmond Semi-Weekly Examiner*, Dec. 18, 1860. "Most of the Northern members [of Congress] were elected on the issues which these resolutions were designed to remove. . . . Withdraw the slavery question from the halls of Congress and thus from the hustings, and what would become

"Does history present us with a single instance of a party retreating from its position and becoming more modest and forbearing on the attainment of power?" asked *The New Orleans Bee*. "Is it to be supposed that the success of the Black Republicans will limit their encroachments and render them less aggressive to the South?" [6] "The same hand that plants the seed does not always reap the harvest," said *The Daily South Carolinian* of Columbia. "And as this party has advanced from one *idea* of hostility to another, from the same causes, when in power, it will advance from one *act* of hostility to another, in each advancement sustaining itself by an appeal to Northern support to protect it from Southern imperiousness, until the ruin of the South will have been accomplished." [7]

The speeches of Lincoln and Seward during the campaign were not of a nature to remove this growing apprehension from the minds of the Southern people. Lincoln acknowledged the plaudits of a large gathering at Springfield, August 14, as "evidence that four years from this time you will give a like manifestation to the next man who is the representative of the truth on the questions that now agitate the public; and it is because you will then fight for this cause as you do now, or with even greater ardor than now,

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of Hale, what of Sumner, what of Wilson, and what of the lesser rabble whose office it is to carry lucifer matches to light up the incendiary torches which other hands hold up? These men must give up their occupation to restore peace." — *The Daily Picayune*, New Orleans, Jan. 19, 1861. "Does it not shock common sense, and violate all experience, and is it not contrary to human nature to believe that a party which has for twenty-five years been struggling with fanatical zeal for the establishment of a *principle*, upon which to administer the government, will, in the very moment of victory, and when the sweets of power, long untasted, are within its grasp, surrender that principle which is its life, and suffer those sweets to turn to ashes on its lips." — *The Daily Herald*, Wilmington, North Carolina, Feb. 6, 1861. "Upon the accession of Lincoln to power, we would apprehend no direct act of violence against negro property, but by the use of federal offices, contracts, power, and patronage, the building up in every Southern State of a Black Republican party . . . to become in a few short years the open advocates of abolition, the confiscation of negro property by emancipation sudden or gradual, and eventually the ruin of every Southern State by the destruction of negro labor." — *Richmond Enquirer*, July 10, 1860.

[6] *The New Orleans Bee*, April 21, 1860.

[7] *The Daily South Carolinian*, Columbia, Aug. 3, 1860.

though I be dead and gone, that I most profoundly and sincerely thank you." [8] Meanwhile Seward had proclaimed, at Boston, that the sole claim of Lincoln to the presidency was that "he confesses the obligation to the higher law . . . and avows himself, for weal or woe, for life or death, a soldier on the side of freedom in the irrepressible conflict between freedom and slavery." These speeches received wide publicity in the South and were commented upon editorially as evidence that the leaders of the party had no intention either of renouncing their attitude toward slavery or of relenting in their crusade against it. One is impressed with the widespread acknowledgment of the fact that these men were not agitating the slavery question as a matter of political expediency alone, but as men engaged in a great moral crusade who could not retract with honor or the least degree of self-respect.[9]

One may very well ask, then, "With what would the Southerners have been satisfied in November and December, 1860?" They wanted the slavery question settled in such a way as to relieve public statesmen, North and South, from its thraldom of intolerance and fanaticism; to insure that the power and patronage of the federal government would not be used to divide slaveholder against non-slaveholder and thus carry into the Southern states themselves a conflict which would arouse restlessness among the slaves; [10] to free Southern men from the long-continued denunciations in the name of Christian morality and accusations of moral

[8] *Life and Works of Abraham Lincoln* (Centenary edition), 5 : 85.

[9] *The Daily Herald*, Wilmington, North Carolina, Feb. 6, 1861; *The Daily Courier*, Louisville, Sept. 4, 1860.

[10] "The great lever by which the abolitionists hope to extirpate slavery in the States, is the aid of non-slaveholding citizens in the South. They hope and propose to array one class of our citizens against the other, limit the defense of slavery to those pecuniarily interested, and thereby eradicate it. . . . They address themselves to the laboring men of the South, undertake to convince them that slavery degrades labor and prostitutes the social status of the laborer." — *The Kentucky Statesman*, Frankfort, Oct. 5, 1860. "We have been fighting against abolitionism at the North; and, as a contest of sections within the Union, we have lost the battle. Let us beware of the day when the struggle shall be transferred to our own soil; when the slavery question shall cease to be a sectional question, and shall become a domestic question; when the armies of our enemies will be recruited from our own force." — *The Daily Delta*, Nov. 1, 1860.

turpitude.[11] Finally, they desired nothing less than a complete acknowledgment of the rights of slavery in the territories, accompanied by a general manifestation of change of sentiment in the North sufficient to justify the belief that it was the recognition of a right and not a concession made on the basis of expediency.[12] Northern men insisted that they had no designs against slavery in the states. Southerners, knowing that words are often used to conceal ideas as well as to express them, were demanding a token that the heart was right. *The Review* of Charlottesville spoke volumes when it said: "There is a habit of speaking derisively of going to war for an *idea* — an abstraction — something which you cannot see. This is precisely the point on which we would go to war. An idea is exactly the thing that we would fight for. . . . The people who will not fight for ideas, will never retain the spirit to fight for anything. Life loses its highest meaning, when opinions become matters of indifference. It is the reproduction of the old fallacy, that it does not matter what a man believes; it is only his acts that are to be looked to. But a false belief necessarily begets wrong actions. A man's belief *is the man*. . . . Therefore, we say, for this *idea* of State honor — for this abstract principle of not bating her just claims upon threat of coer-

[11] "Let neither the North believe we expect or desire or that any true man of the South wishes for a Union with the perpetual agitation, the insulting taunts, the bold aggression, the nullified laws which have formed the grand features of the past." — *The Daily Picayune*, New Orleans, Dec. 4, 1860. See also *The Daily Herald*, Wilmington, North Carolina, Jan. 7, 1861; *Daily Nashville Patriot*, Feb. 19, 1860; *Addresses Delivered before the Virginia State Convention by Hon. Fulton Anderson, Commissioner from Mississippi, Hon. Henry L. Benning, Commissioner from Georgia, and Hon. John S. Preston, Commissioner from South Carolina, February, 1861* (Charleston, 1861), p. 61.

[12] "The people of the South . . . don't want even their rights; if those rights are to be grudgingly and reluctantly granted. Unless justice comes from the heart of the North, and not from its pocket, we prefer to depart and go our ways separately." — *New Orleans Daily Crescent*, Feb. 14, 1861. "Such wide, deep, growing discords are not to be appeased by palliatives, or put out of the way by the interchange of friendly promises and protestations which those who give may not have the power to redeem, and which may lose their value with the passing of the emergency which extends them." — *The Daily Picayune*, New Orleans, Nov. 25, 1860. See also *The New Orleans Bee*, Dec. 22, 1860; and *The Frankfort Commonwealth*, Jan. 23, 1861.

cion — we would convulse this Union from centre to circumference." [13]

It would seem, therefore, that the submission of the Davis Resolutions in the Senate during the summer of 1860, the pressing to a conclusion of the territorial question in the Democratic national convention at Charleston, and the presentation of proposed constitutional amendments by Toombs and others from the lower South in the second session of the Thirty-sixth Congress, were steps in a general program of testing, again and again, the strength and stability of Northern antislavery sentiment. Convinced of its permanency, the spokesmen of the lower South have left us no record of a willingness to restrain secession sentiment after the November election. On the contrary, there is abundant evidence that the cotton states at least were gone before the Crittenden Amendments were seriously considered by Congress in December.[14]

The Republicans contended that the establishment of the principle of protection would somehow lead to the reopening of the African slave trade and a further extension of slavery. Henry J. Raymond, editor of *The New York Times*, summed up their position thus: "The principle you assert is the absolute equality of the States in regard to the tenure of property . . . you and your associates know that if you can establish the principle today, you can claim all the consequences that may flow from it tomorrow." [15] Men of this mind controlled the majority of the legislatures in the North and were powerful enough to prevent the adoption of constitutional amendments by Congress. They were sustained by Lincoln, who advised them to "hold firm, as with chains of steel," on the territorial question because a compromise (which in itself was not acceptable to the South) only "puts us under again, and leaves all our work to be done over again." [16]

[13] *The Review*, Charlottesville, Jan. 25, 1861.

[14] *The Daily Courier*, Louisville, Dec. 27, 1860; *The Florence Gazette*, Nov. 28, 1860; *The Daily Constitutionalist*, Augusta, Dec. 1, 1860; *The Daily South Carolinian*, Columbia, Dec. 2, 1860; *New Orleans Daily Crescent*, Dec. 11, 1860; *The New Orleans Bee*, Dec. 24, 1860.

[15] *Disunion and Slavery. A Series of Letters . . . by Henry J. Raymond, of New York*, pp. 12–13.

[16] Lincoln to Washburne, Dec. 13, 1860, in *Life and Works of Abraham Lincoln*, 3 : 280.

It may be that any effort in the direction of conciliation on the part of the party leaders would have been futile. The prevalence of Union meetings throughout the North is no indication of a willingness on the part of the rank and file of the Republican party to abandon their views on the slavery question or their policy with respect to the maintenance of federal authority in the seceded states. The leading advocates of compromise in the North, in and out of Congress, were Douglas Democrats, men like Douglas, Pugh, Fitch and Bright, who either had been defeated at the polls in the recent election or were in line for defeat at the next election, and who welcomed the opportunity of bolstering their political fortunes by advocating compromise in the short session of Congress. A successful consummation of their efforts would have placed them in a strategic position, because it involved the abandonment by the Republicans of their political capital. To have agreed to compromise, that party's leaders would have had to abandon their own honest convictions on a great moral issue, to resist the known wishes of their constituents, and to surrender the permanent control of one hundred million dollars in patronage already within their grasp.

Lincoln was one of the shrewdest interpreters of public opinion in his day and his honest convictions on the slavery question were not weakened by the dictates of party politics.[17] There is evidence that other leaders of the party feared any indication of recession on their part would shatter their party's organization. When, at the invitation of Virginia, delegates from twenty-one states met in extralegal convention at Washington during February, 1861, Michigan, Wisconsin and Minnesota were not represented. On February 11 Senator Chandler of Michigan telegraphed to Governor Blair: "Governor Bingham and myself telegraphed you on Saturday, at the request of Massachusetts and New York, to send delegates to the peace or compromise Congress. They admit that we were right and that they were wrong; that no Republican State should have sent delegates; but they are here and cannot get away. Ohio, Indiana, and Rhode Island are caving in, and

[17] Lincoln to Trumbull, Dec 28, 1860, *Life and Works of Abraham Lincoln*, 3 : 256.

there is danger of Illinois; and now they beg us, for God's sake, to come to their rescue and save the Republican party from rupture. I hope you will send *stiff-backed* men or none." [18]

In line with that program, the Republicans in Congress, after a lapse of so much time that the situation had passed beyond the control of legislative procedure, came forward with an offer of a constitutional amendment to prohibit by congressional action the abolition of slavery within the limits of the states. It was either an empty gesture or evidence of a prevailing doctrine of consolidation far beyond that openly proclaimed. That move strengthened Southern opinion about the ultimate designs of the Republican party, for as Douglas so ably said: "The fact that you propose to give the assurances on the one point and peremptorily refuse to give it on the others, seems to authorize the presumption that you do intend to use the powers of the Federal Government for the purposes of direct interference with slavery and the slave trade everywhere else. . . ." [19]

The longer compromise was delayed, the more difficult any amendment of the fundamental law became without arrangements for some sort of self-protecting power in the control of the slave-holding states. It is extremely doubtful whether one could have been effected without the other at any time after Lincoln's election, a fact not fully understood at the time nor by historians since.

A rational consideration of the question demands recognition of the fact that a twofold revolution was in progress. The elevation of the Republican party to power was none the less a revolution because in accord with constitutional form. It purposed the circumscription and ultimate extinction of an institution vital to the social and economic life of the South. Its members openly proclaimed the necessity of a reorganization of the judiciary in order to circumvent the constitutional safeguards set up for the protection of minority interests, meanwhile maintaining its authority through the legislative and executive departments already in its control.[20] The object of that revolution was to remove the

[18] Chandler to Blair, Feb. 11, 1861, in *Cong. Globe*, 36 Cong., 2 Sess., II, 1247.

[19] *Ibid.*, 36 Cong., 2 Sess.

[20] Conkling of New York, remarks in the House of Representatives, April 17, 1860, *Cong. Globe*, 36 Cong., 1 Sess., IV. Appendix, p. 236; Gooch

restraints of a fundamental law, as interpreted by the judiciary, from the will of a numerical majority in a consolidated nation; in short, to bend the forms of a republican government to suit new democratic principles. One of the most interesting statements ever made by Lincoln was that a concession to Southern demands with respect to the territories would lead to a Supreme Court decision setting aside state constitutions which prohibited slavery. The right of the people of a state and of them alone to recognize or abolish the institution of slavery by their constitution was the foundation of the entire constitutional theory of state rights. That Lincoln honestly entertained the opinion expressed above there is no doubt. It is evidence that he regarded the states as political subdivisions of the United States, bearing the same relation to the United States that a county bears to a state; and when he publicly expressed that opinion at Indianapolis on his way to Washington secession sentiment swept like a raging fire through the upper South.

From the beginning of the slavery controversy far-sighted Southerners had predicted the time when existing governmental machinery would no longer suffice as a protection for their institutions against the aggressions of a dominant Northern majority. Conscious of the fact that the victory of a party which claimed the right of the federal government to judge the limits of its own powers would seriously threaten if not annihilate the reserved rights of the states,[21] the dominant majority in the lower South were ready to take their states out of the Union after Lincoln's election. The majority in the upper South, whether they subscribed to the theoretical right of secession or justified resistance

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of Massachusetts, remarks in the House of Representatives, May 3, 1860, *ibid.*, pp. 291–295; Vandever of Iowa, remarks in the House of Representatives, April 27, 1860, *ibid.*, p. 269; and Wade of Ohio, remarks in the Senate, March 7, 1860, *ibid.*, p. 153.

[21] "The Government will be the minister of the orders of a numerical majority of the whole people, not the agent of the States. . . . No change can be effected in the action of the Government, except by an appeal to this majority at the election held for Federal officers. . . . The supreme despotism of numbers will know no restraint but its own will, use no ministers but its own appointees, have no policy but that desired by its own agents dependent for bread and place on its pleasure. The reign of national demagogues will be inaugurated." — *Richmond Semi-Weekly Examiner*, Nov. 9, 1860.

to aggressions upon the inherent right of revolution, placed the burden of proof upon the federal government in any controversy between it and a state. That fact is shown clearly by their denial of the constitutional right of coercion. If they had been willing to agree to constitutional amendments embracing the slavery question alone, which is doubtful, pressure from the seceded states would have created a united South in demanding some sort of self-protecting power along the line of Calhoun's doctrine of concurrent majority. The *Richmond Semi-Weekly Examiner* expressed a widely prevailing sentiment when it said: "We would not give an iota for all the provisions that human ingenuity can devise, if they do not have the essential requisite of putting real power of self-protection in the hands of the Southern people. . . . The contest can be definitely settled only by an arrangement which shall secure to the South the exclusive control of this property and these institutions." [22]

The fierce controversy which raged in the upper South over the expediency of joining the Southern Confederacy held in abeyance for a time any discussion of the speculative idea of a self-protecting power for minorities. The rapidity with which antisecession papers sprang to its defense after Lincoln's first speech at Indianapolis is evidence of a prevailing consciousness of the vital issue involved in the controversy and of the utter futility of attempts then being made in Congress and the Washington Conference Convention to effect conciliation by a compromise of the slavery question. *The Wilmington Journal* characterized that speech as "a specimen of such consolidation doctrine as few men would have dared to utter, and none of any party at the South can possibly sustain." [23]

[22] *Richmond Semi-Weekly Examiner*, Dec. 7, 1860. "New and more efficient securities must be provided and placed for execution in the hands of the owners of slave property. This must be the object and ultimate achievement of any action now taken by the people of the Slave States." — *Ibid.*, Nov. 13, 1860. "We have believed, and still believe, that Constitutional amendments rendering unnecessary platform definitions of Southern rights, or executive construction of the Constitution, would be the only terms upon which peace can be restored to the States, and the Union be preserved." — *The Daily Picayune*, New Orleans, Dec. 20, 1860.

[23] *The Wilmington Journal*, Feb. 16, 1861. "Mr. Lincoln told us that the States are to the Federal Government what the counties are to the States —

Referring at a later date to the political theories reflected in this speech and the one delivered a few days later at Stubenville, Ohio, *The Missouri Republican* asked: "Has it come to this that the Union is an entity, distinct from the States which compose it? . . . Once admitted, and American freedom will soon stand trembling before the Presidential throne. The States are the true guardians of our freedom and our rights, and when their power is gone, the master at the Federal Capital is the ruler over subject millions — an emperor, elected or self-appointed, as the times determine."

Finally, the secession of South Carolina, December 20, followed in rapid succession by that of six other states and the formation of the Southern Confederacy, thrust a new element into the question of conciliation. No state, after having released its citizens from all obligation to the authority of the government of the United States, would have consented to participate in amending a constitution which they refused to recognize as applying to them. Any compromise amendments agreed to by the remaining states must have become a basis of negotiation for a reconstruction of the Union. After the formation of the Southern Confederacy reconstruction could have been accomplished only by annexation following recognition of its existence as an independent nation.

The same obstacle prevented the calling of a national convention. Innumerable demands for such a convention were made. The whole influence of pacifists was directed to that end after the failure of the Crittenden Amendments in Congress, without any apparent understanding that a convention for the purpose of amending the constitution was impossible. The seceded states might have agreed to a general convention similar to the convention of 1787, no state being under obligation to adhere to the results of its deliberations. To have entered a convention without a clear understanding on that point would have been a tacit agreement to

no more and no less . . . not Judge Taney and his venerable associates, not the people of the States respectively, but a majority of the people of the whole country are to determine whether Kentucky and Tennessee, and Virginia have any rights, and if so, what they are." — *The Daily Courier*, Louisville, Feb. 16, 1861. See, also, *Daily Nashville Patriot*, Feb. 15, 1861; and *The New Orleans Bee*, Feb. 27, 1861.

abide by its decisions. Those states had resorted to secession because of the conviction (1) that they could not with safety remain in the Union as it was, and (2) that the Constitution would not be amended in such a way as to secure their rights. To have entered a convention would have been to submit to the dominant sectional majority in another form.

Without the participation of the seceded states, or an acknowledgment of their independence, twenty-six of the remaining twenty-seven states would have had to make application for the convention, and an equal number to agree to its results for their incorporation into the fundamental law. That accomplished and the fact still remained that seven states were by their own action estopped from recognizing it as an amended constitution for a Union of which they were not a part. Only as a basis for negotiation would such an amended constitution have possessed any efficacy. The issue was clearly understood in the South and, from first to last, throughout the entire program of attempted conciliation they refused to surrender the principle of free consent.[24]

The dominant party in the North, as shown by the utterances of their party leaders and the resolutions of state legislatures, was equally consistent in regarding the powers of government, in all circumstances, as legitimate and those who exercise them as under obligation to maintain the government's integrity by force.[25] They refused to recognize that a people and not a mob or a faction

[24] "Negotiation, and not legislation, alone can restore peace; the States, as parties to the Constitution, must be brought into direct negotiation, with the ultimatum of separation distinctly and unmistakably tendered by South Carolina as an earnest of what will certainly result from a failure of pacific negotiation." *Richmond Enquirer*, Dec. 18, 1860. "A convention as in the original States, for a new constitution, where each state would be at their liberty to join in the new Union might once have been accepted, but a convention bound up in the forms of unrestricting acquiescence is totally inadmissable." — *The Daily Picayune*, New Orleans, Feb. 10, 1861.

[25] "Resolutions of the Legislature of the State of Ohio, on the State of the Republic." *House Misc. Docs.*, 36 Cong., 2 Sess., Doc. 18; "Resolutions of the Legislature of the State of Maine relating to existing national Affairs." *ibid.*, Doc. 26; "Joint Resolutions of the Legislature of the State of Minnesota on the State of the Union." — *ibid.*, Doc. 33; "Resolutions of the Legislature of the State of Pennsylvania, relative to the Maintenance of the Constitution and Union." — *ibid.*, Doc. 24; "Joint Resolutions of the Legislature of the State of Michigan, relative to the State of the Union." — *ibid.*, Doc. 38.

was in motion. The startling rapidity with which events moved during the period under consideration gave little opportunity for an expression of enlightened public opinion. One may question, therefore, whether any plan of conciliation was possible, short of a recognition of the Confederate States as an independent power. One may, with equal candor, inquire whether the permanence of governments should rest upon the free judgment of men and the needs of society or upon metaphysical theories of political perfectibility.

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THE ENGLISH PERIODICALS AND THE NOVEL, 1709–40

CLAUDE M. NEWLIN

THE Englishman of the first part of the eighteenth century inherited a rather large library of prose fiction for his light reading: late prose versions of the romances of chivalry; Sidney's *Arcadia;* seventeenth-century French romances and English imitations of them; and Italian, French and Spanish novellas. He also inherited the habit of reading fiction, but his supply of novels remained largely anachronistic and exotic during the first decades of the century. There was, however, a drift from the amorous, immoral, unreal and foreign types of fiction toward a moralized English novel. Prose fiction was sentimentalized very much as the drama was in the same period. To this development the periodicals made important contributions both in criticism of fiction and in the publication of stories. It is the purpose of this paper to present an interpretation of this movement as it is revealed in *The Tatler*, *The Spectator* and *The Guardian*, and in the later periodicals.

Addison, Steele and Budgell had little respect for the prose fiction current in their day. To them, novels, like red heels, topknots and beauty patches, were foibles of silly women — old and young. The catalogue of Leonora's library [1] is of course the *locus classicus* which is always cited to show Mr. Spectator's attitude toward the fashionable fiction, but this satire is only one of a rather large number of mild attacks on novel reading. The gallery of novel-reading women ironically portrayed in *The Tatler*, *The Spectator* and *The Guardian* includes Jenny Bickerstaff,[2] Mrs. Feeble,[3] Cornelia Lizard [4] and a nameless country lady and her daughters.[5]

[1] *Spectator*, No. 37. [2] *Tatler*, No. 75. [3] *Ibid.*, No. 266.
[4] *Guardian*, No. 58. [5] *Spectator*, No. 128.

The essayists considered novel reading to be dangerous as well as foolish. Budgell forbade women novels and chocolate during the month of May, since both are dangerous inflamers of the passions during this carnival of nature.[6]

Steele also shows us some novel-reading men: a young rake who reads "secret amours";[7] James, a servant in a great family, who spends his time reading romances "as well as he can";[8] "a fair youth," who is absurdly dressed "by some description in a romance";[9] and James Miller, whose exaggerated sense of honor had "something resembling the old Heroes of Romance."[10]

The early periodical essayists attacked the novels themselves as well as novel reading. The romances they considered to be too sentimental, unreal and improbable.[11] The novels of Mrs. Manley they dismissed as mere scandal writing.[12] Steele regretted their popularity with the ladies of the court.[13]

Addison, however, was not wholly intolerant of fiction. He once confessed: "I love to amuse myself with the accounts I meet with in fabulous histories and fictions; for in this kind of reading we have always the pleasure of seeing vice punished and virtue rewarded."[14] He also recommended that the poet who would compose in "the Fairy way of Writing" should be very well versed in legends, fables and "antiquated Romances."[15]

It was only the antiromances, however, that received the unqualified approval of these writers. *Le Roman Comique*[16] and *Don Quixote* seemed to them embodiments of good sense and antidotes to romantic folly.[17]

Although Mr. Spectator and his colleagues evidently did not view the existing prose fiction as being, on the whole, a profitable kind of literature, there are indications that they saw dimly the possibility of a worthy type of novel based on real life. Steele said: "I was thinking it would be of great use if anybody could hit it, to lay before the world such adventures as befall persons not

[6] *Spectator*, No. 395. [7] *Guardian*, No. 151. [8] *Spectator*, No. 71.
[9] *Ibid.*, No. 104. [10] *Ibid.*, No. 436.
[11] *Ibid.*, Nos. 312, 315, 377, 477; *Guardian*, No. 139.
[12] *Guardian*, No. 107; *Tatler*, No. 243. [13] *Tatler*, No. 63.
[14] *Tatler*, No. 117. [15] *Spectator*, No. 419. [16] *Guardian*, No. 92.
[17] *Tatler*, No. 152; and *Guardian*, No. 135.

exalted above the common level." [18] Addison wrote a fictitious description of a "new-fashioned novel" which would accomplish for English plays what *Don Quixote* had done for Spanish romance.[19]

Messrs. Tatler, Spectator and Guardian were true to their critical doctrine in the stories which they wrote. Their fictional contributions do not include merely the character sketches and the Sir Roger de Coverley papers, which have claimed so much attention in histories of the novel. They also utilized the novella form, moralizing it as Steele had moralized the Restoration comedy. Steele's *History of Tom Varnish* is, for instance, essentially an intrigue novel turned upside down, the young gallant instead of the wealthy bourgeois husband being made the object of ridicule.[20] His *History of Celia* was written to arouse sympathy for a young rake's victims, not to glorify his amorous conquests.[21] Addison wrote a Spanish novella in which he tried to arouse pity for the wronged elderly husband.[22] One of the *Spectator* tales clearly points the way to *Pamela*. Amanda, whose father has been reduced to low condition by financial losses, takes service with a farmer. The lord of the manor entertains a design upon her virtue. She resists his effort to make her his mistress, and he is finally so much moved by the spectacle of virtue in distress that he marries her.[23]

The periodical writers who followed Addison and Steele showed substantially the same attitude toward fiction as did their masters, and also continued the process of moralizing the novel.

A contributor to *The Universal Spectator* [24] ranked the French romances with books on palmistry and magic. Another essayist in the same periodical [25] held that novels, like the company of servants and rakes, taught obscene conversation to children in great families. Still another showed [26] that an intelligent young lady, who enjoyed serious reading in secret, had to scatter plays, operas and novels about the parlor in order to appear modish.

[18] *Tatler*, No. 172. [19] *Spectator*, No. 446. [20] *Tatler*, No. 136.
[21] *Ibid.*, No. 198. [22] *Spectator*, No. 198. [23] *Ibid.*, No. 375.
[24] No. 287. April 6, 1734. [25] No. 207. September 23, 1732.
[26] No. 578. November 3, 1729.

Henry Baker, the son-in-law of Defoe and the first editor of *The Universal Spectator*, dealt sharply with maiden aunts and grandames who read romances, which, he said, "ruin more Virgins than *Masquerades* and *Brothels*." He particularly objected to fiction as reading for the middle classes. "I leave you to judge," he said, "what an excellent Housewife a Damsel is likely to make, who has read the *Persian Tales*, 'till she fancies herself a Sultana." He made an exception of such prose narratives as *Telemachus*, but, he said, "it requires some Degree of good Sense to relish them; and therefore People of middling Capacities hardly ever give them the Reading, tho' every *Footman* and *Chambermaid* are fond of the lewd Inventions of H—d or M—l–y." [27]

In a story published in *The Universal Spectator*,[28] novel reading is given as one of the bad habits which led a young woman to prostitution. Of novels she said: "They did me great injury by filling my head with romantick Ideas."

In general, then, the periodical essayists who followed Steele and Addison persistently attacked novel reading. A contributor to *The Plain Dealer* (1724),[29] however, found a basis for a guarded defense of the habit. Giving advice about the reading of two young ladies, one of whom was addicted to romances and novels, he showed how the works of fiction at least established a reading habit, and gave the young reader heroes and heroines to admire. From this point, he said, a bookish young lady could be led on to enjoy such works as Steele's *Christian Hero* and Lord Halifax's *Letter to his Daughter*.

While the periodical writers almost universally condemned novels and romances, Levinz, writing in *The Universal Spectator*,[30] said: "I must own to my Approbation of a sort of Minor Historians, who, in Papers of this Kind especially, have entertain'd the World, with Relations of what has pass'd in the Middle State of Life."

The successors of Addison and Steele also followed the example of their predecessors in adapting the short novel to their own

[27] Mrs. Haywood and Mrs. Manley. *The Universal Spectator*, No. 91. July 4, 1730.
[28] No. 367. October 18, 1735.
[29] No. 62. October 23, 1724.
[30] No. 104. October 3, 1730.

purpose of inculcating good middle-class English morals. The stories in the periodicals of the 1720's and 1730's are frequently, however, more elaborate and more passionate than those in the early periodicals. By 1722 prose fiction of this emotional type had evidently proved to be an economic asset to a periodical. A writer in the *Weekly Journal; or Saturday Post* said [31]:

> I dare pronounce that, at this Time, whilst every thing in Nature seems to smile, and the *Sap* is rising in all *Plants* and *Vegetables*, as well as *young Men* and *Maids*, a short *Romance*, *Novel*, or *Love-Story*, prettily interlarded with double *Entendres* wou'd go off extreamly well, and wou'd propagate this Paper more than any thing else.

As this remark suggests, the periodicals published short romances, descendants of the long French romances, and novels imitating the Spanish type in at least names of characters and places. Also, they contained many moral essays, which were mainly narrative in content, and a few "secret histories." Surveying typical specimens of this material in chronological order, we find a halting progress toward the realism and sentimentalism of the Richardsonian novel.

In 1722 a curious and hitherto unnoticed romance, *The Story of Ceremila and Roderiff*, saw the light in *The Weekly Journal; or, British Gazetteer*.[32] It fills numbers nine to sixteen of a series of periodical essays entitled *The Fairy Tatler*. The setting is ostensibly the England, Wales and France of King Athelstane's time, but the actual *milieu* of the narrative is the unreal world of the romance of passion. The story is said by the author to illustrate the evils of jealousy, but the ethical motive exists in the prefatory promise only. It is a triangle story, with Roderiff and Ceremila as husband and wife, and Le Brun, a French nobleman, as the interloper to whom Ceremila unresistingly yields. The ending, which tells of Roderiff's attempt to rescue his wife from the home of the wicked lover, illustrates the violent but feebly motivated passion and action of the novel:

> No sooner had Roderiff arrived at the Place, but he met with the Servant who had that Day brought him the Letter; he was a trusty Friend to *Ceremila*,

[31] No. 182. May 26, 1722. [32] February 3 to March 4, 1722.

and therefore *Roderiff* took the Opportunity of acquainting him with his Design: The Servant, after he had heard him, told him *Ceremila* was, indeed, pretty closely confin'd, but, however, if he would run the Hazard, he would venture to convey him to her, which accepted, in they went by a Back-way; but as they were going through a Passage, they were met by *Le Brun*, who knowing *Roderiff*, and hastening upon him, in a Rage commanded him to be Bound; *Ceremila*, whom he had just before left, hearing a Noise ran down, and seeing Roderiff Bound Bloody with the Wounds that *Le Brun* had given him she swoon'd on the Floor, but soon recovering, *Le Brun* gave her his Dagger, swearing, that if she did not strike it in *Roderiff's* breast, he should be Murder'd piece-meal before her Eyes. She with a smiling Willingness, took a Dagger, and pretending to Stab Roderiff, who fix'd his eyes upbraidingly upon her, she struck it into *Le Brun's* Breast, who, before he fell, having strength left to catch it from her, struck it into Roderiff's Brain-Pan, of which he died immediately, only he had Life enough first to stagger to *Ceremila*, and fell at her Feet: *Ceremila* seeing him Dead, tore her Hair, rav'd, and wept, embrac'd his dear lov'd Body, curs'd her Unkindness, Fickleness, and Pride; and to close the sad Scene, put an End, at last, to her wretched Life with her own Hand.

Such was one kind of fiction which evidently was written to "propagate" a paper at the time when Alexander Pope was translating *The Iliad* according to neo-classical literary canons. Yet, on the whole, the periodical stories of this period were moving away from the romance tradition.

In 1724 *The Plain Dealer* [33] published a sentimental story of Courthope and Bellaria, who were captured by pirates, sold into slavery, and placed in the same cell. Courthope found some money hidden there, but not enough to ransom both himself and Bellaria, so that he redeemed Bellaria alone.

An indication of the attitude of the public toward fiction laden with moral sentiment is found in a discussion of this story published a week later. The author of the tale, in what was no doubt a fictitious account, said: [34]

Being the other day in a large Company at a Gentleman's House in *Covent-Garden*, I was highly delighted, to hear a young and beautiful *Lady* acknowledge that Tears flow'd from her Eyes, upon reading of the Story of *Courthope*. . . . But when she added, *That she had been a* Coquette *too long*, and if *ever it should be her Fate to meet with a Suitor of* Courthope's *Desert, she would let him lose no Time, for fear of Accidents:* when I perceived she made this *frank* Confession, not only with her *Lips*, but from her *Heart*, I confess

[33] No. 5. April 6, 1724.

[34] No. 7. April 13, 1724.

I began to conceive Hopes of knowing very speedily, *That some* visible Fruits *would arise from these my* Labours.

I was therefore a little concern'd when I found myself interrupted by a young *Wag*, who was pleased to pass Pertness upon the Company for Jesting. "That *Plain Dealer*, said he, is *a well-meaning Writer*, but he does not strike out a Meaning *cleverly*. This is one of the best Stories I have read, upon the subject of *Love;* only, there is not one *Double-Meaning* through the Whole, and that makes it Insipid."

In 1729 Henry Baker published a "Spanish story," as he called it, in *The Universal Spectator*.[35] It was written to show the evil results of arranging marriages for wealth and position, and is sincerely moralized. Its workmanship is cruder than that of Addison's Spanish novel, but it shows more emotion and movement.

In the same year, 1729, *The Weekly Journal; or, British Gazetteer*[36] published a story described in the prefatory note as a "secret history" — the type cultivated by Mrs. Manley.

Lothario, a young gentleman of good family, great natural parts, and learned and polite education, was placed in a gentleman's house to study law. There lived also Sylvia, a young lady of small fortune but great natural endowments. Love naturally followed. Then Lothario's uncle, on whom he was dependent, was accused of crimes against the state, and the young man hid himself in the country, where he was enmeshed by the snares of Corinna, a prostitute. Finally he was imprisoned for debt. Sylvia, in disguise, visited him in prison. Chastened by hardships, he repented, and the lovers were reconciled.

With its romantic names but realistic incidents, such a story represents a type of narrative which was uniting real life and a literary tradition characterized by unreality.

The next year, 1730, *The Universal Spectator*[37] contained *The History of Beau Bronze the Fortune Hunter*, written by Levinz. The setting is quite definitely English. Beau Bronze leaves the University for London, and there lives like the typical gallant of his period. He pursues a beautiful young heiress, but eventually

[35] No. 37. June 21, 1729. The author of the story is identified by a manuscript list of contributors to *The Universal Spectator* in the Hope collection of periodicals in the Bodleian Library.

[36] No. 211. June 7, 1729.

[37] No. 104. October 3, 1730. The author is identified by the Bodleian list.

marries the Widow Thrifty — seventy years old, and incorrectly reputed to possess a forty-thousand-pound fortune. Thus we have a short novel presenting realistically the kind of material which, in the early eighteenth century, usually went into essays and comedies.

In 1732 *The Universal Spectator* [38] carried the story of Florio and Cordelia. The young couple's domestic felicity was temporarily disturbed by Sylvia, who came on the scene, bringing with her a train of complications, during an outing at Barn Elms. The climax and resolution are brought about partly by the financial disturbances produced by the Mississippi Bubble. In this, as in numerous other stories of the time, real English people show dimly through the cloud of conventional romantic names, and real scenes and events enter into the romantic framework.

The progress toward realism was not steady, however. The next story of interest, published in *The Universal Spectator* [39] in 1734, is localized in London, but its emotional tone and its characters, Clerimont, Arabella and Cleanthes, are merely those of conventional romance.

The following year (1735), however, saw a more realistic treatment of English character in a story in *The Universal Spectator* [40] entitled *Hypocrisy Outdone; or, The Imperfect Widow.* Will Snapmore, the villain, was "a very handsome gay spark, of most pernicious principles, and a damnable deluding tongue to womankind." Having left his excellent young wife, Arabella, for the wars in Flanders, he was wounded, and had word sent home that he was dead. After marrying in the Netherlands and squandering his second wife's fortune, he returned to London. There he successfully courted Laeda, a wealthy and amorous old maid who affected an extreme form of English Protestant piety, which Will Snapmore simulated. When chance almost brought him in contact with his first wife, he absconded, taking with him a large part of Laeda's fortune. The point of interest in the story is its realistic portrayal of two indigenous character types, Will Snapmore and Laeda.

[38] No. 182. April 1, 1732.
[39] No. 260. April 27, 1734.
[40] No. 328. January 25, 1735.

This brings us within five years of *Pamela*, which was completed early in 1740. While Richardson's novel was still in manuscript, *The Universal Spectator* [41] published a story which is strikingly similar to it. It tells of a young lady who took service in a genteel family; who resisted the attempts of the son, Bellamond, to make her his mistress; and whose virtue was rewarded by marriage with the gallant rake.

So, for thirty years, the English periodical writers had been calling for a moralized English novel, based on English life, and adapted to middle-class readers. They had also pointed the way to this achievement by Anglicizing the old novel forms. It is not surprising, then, that some of them recognized the kinship of Richardson's work with their own efforts.

On October 11, 1740, just before *Pamela* was issued, a correspondent to *Hooker's Weekly Miscellany* said: "As the Design of your Paper is to promote Virtue; I beg leave, thro' your Hands, to convey a Letter to a very worthy friend of mine, who is engag'd in the same noble Cause upon the same generous Principles. He has written an *English Novel*, with a truly *English Spirit* of unaffected good Sense, and yet with a great deal of Invention and Ingenuity. It is intitled, *Pamela*, or *Virtue Rewarded*."

In the open letter to Richardson which was introduced by this note the writer said: "In short, Sir, a Piece of this Kind is much wanted in the World, which is but too much, as well as too early debauched by pernicious Novels. I know nothing Entertaining of that Kind that one might venture to recommend to the Perusal . . . of the Youth of either Sex, but what tends to corrupt their Principles, mislead their judgments, and initiate them into Gallantry and loose Pleasures."

Very appropriately *The Universal Spectator* [42] also bore witness to the relation between *Pamela* and the periodical tradition. "In the course of my Lucubrations," said the editor, "I have frequently inveigh'd against that barbarous Part of Modish Gallantry, of Gentlemen endeavouring to seduce young Women of inferiour Fortune. . . . For this Reason I was at first pleased with the Story of *Pamela*."

[41] No. 607. May 2, 1740. [42] No. 707. April 24, 1742.

This periodical material indicates that the English public had been well prepared to receive Richardson's work. Whether or not Richardson himself was directly influenced by the remarks on fiction and by the stories in the periodicals is perhaps impossible to determine; but at any rate it seems clear that his work fits into the same movement of sentiment and taste as the fictional contributions of the periodical writers. Austin Dobson says that Pamela "appealed to the humble person as well as the person of quality." [43] Many of the newspaper stories had certainly been composed especially for the humble person. Dobson also says that the professed moral purpose of *Pamela* was "a new thing in a novel." [44] Obviously such a purpose was no new thing to the writers and readers of periodical stories. On the title page of *Pamela* Richardson indicated his conception of the relation of his work to other fiction by saying that it was "intirely divested of all those Images, which, in too many Pieces calculated for Amusement only, tend to inflame the Minds they should instruct." To accomplish his purpose Richardson, then, really wrote an enormously expanded and moralized novella. What is *Pamela* after all but the story of a rake's pursuit of a girl? Such was the typical theme of the novella. But in the novella the rake is always successful, and his success is applauded. In *Pamela* he fails; gallantry is defeated, and virtue is rewarded. So Richardson "divested" the novel of its objectionable characteristics while preserving essential features of its plot. But, whether he was aware of the fact or not, he was not the first to accomplish this feat. For thirty years the periodical writers had been demanding the same thing and performing the same revision of the old plot.

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[43] *Samuel Richardson*, p. 33. [44] *Ibid.*

HAUPTMANN'S GERMAN *HAMLET*

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THE performance of a revised and completely reconstructed *Hamlet* upon the Dresden stage a few years ago went unnoticed in England and America. Even in Germany little discussion ensued, though the revision came from the pen of the leading poet. The reason for this apparent neglect of an interesting problem lay in the inaccessibility of the text. I shall attempt to sketch as clearly as possible in brief compass the important changes in the drama and to discuss a few of the problems that follow directly from them.

Like Goethe, Gerhart Hauptmann approached the Hamlet problem through a novel that he was writing. Unfortunately, that work is still unpublished and the brief extract which has appeared in a Viennese newspaper [1] gives no clue to its content. The latest biographer [2] describes the origin of the idea in these words:

> The work on a novel brought the Hamlet problem to the poet's mind again. Conscious of the parallel with Goethe, he put it into the midst of the performances of a prince's small theatre. Going back to the time of his own Hamlet-like youth, he became engrossed anew in Shakespeare's drama. This preoccupation went so far, however, that the novel was dropped and the interest of the poet was absorbed by the Hamlet problem.

What has made Hamlet more fascinating to every poet than any other of Shakespeare's dramas is at once apparent. It is not only the very heart of the problem, the cause of Hamlet's delay — which puzzled even himself —, but the various suggestions in the text which have complicated rather than solved it and still remain a constant challenge to poets and scholars. In Haupt-

[1] "Kapitel aus dem unvollendeten Roman Hamlet," *Wiener Neue Freie Presse*, Dec. 25, 1928.

[2] Hülsen, H. von, *Gerhart Hauptmann* (Phil. Reclam jun. Leipzig, 1927).

mann's case another reason ought to be considered; even in his earliest works he has treated characters who are faced with situations that trap them. Many of his protagonists are driven to suicide and death because they cannot cope with the tasks imposed upon them or because they lack the ability to adjust themselves to their environment. In noting this similarity no implication is made that Hamlet's difficulties are based on weakness of character, but it is important to call attention to this phase of German *Hamlet* criticism. Since Goethe's publication of *Wilhelm Meister* the accepted Hamlet has been a first cousin to Werther, a delicate, emotional nature suffering an eighteenth-century *Weltschmerz*, failing to perform the duties laid upon him because of inadequate strength. Coleridge's and many other critical theories are mere variations of this general aspect of Goethe's characterization.

Hauptmann, like Goethe, was troubled by certain features of *Hamlet* and the longer he thought about them, the more certain he became that the accepted version of the text is faulty, bears signs of interpolations and mutilations at the hands of inferior writers, and fails to do justice to the dramatic genius of Shakespeare. Goethe had been puzzled by certain incidents that detract from the unity of impression because they belong to the broader scope of the novel. He pointed out that the substitution of a single motif, the hostilities in Norway, for some of the external details surrounding the real tragedy would make the drama more effective. Thus the political difficulties would become the real background and give the tragedy a historical significance.

Hauptmann follows Goethe's lead. He emphasizes the break in the rising action of the plot after the third act, when the Hamlet drama suddenly becomes a Laertes drama. He proceeded, therefore, to revise the accepted text in order to keep Hamlet in the foreground and give the drama a greater unity. Whereas Shakespeare minimized the military conflict and the struggle for the throne of Denmark, Hauptmann stresses the "Haupt- und Staatsaktion." Aside from numerous short additions and changes which lend a martial air to the drama, there are two big interpolations in the first half of the drama: one presenting old King Nor-

way discussing with his English counselor the rumors coming from Denmark; the other presenting Fortinbras on the plains, ready to march against Elsinore. Still another addition just before the performance of the "mousetrap" gives indication that the Danes are loyal to Hamlet, waiting only for his word to rise against the king.

The changes in the fourth act are more significant: Scene 1 is a contraction of Shakespeare's Scenes 1 and 3, whereas Scene 2, in which Rosencrantz and Guildenstern are looking for the body of Polonius, is omitted completely. There follows an interpolation as Scene 2, which is an adaptation of Shakespeare's Scene 4 on the plain of Denmark. Hamlet meets Fortinbras and is assured aid. The big monologue, "How all occasions do inform against me," is omitted, of course, because there is no longer the sharp contrast between Hamlet, the man of thought, and Fortinbras, the man of action.

Scene 3 is Shakespeare's Scene 6, in which Horatio receives the letter from Hamlet. Scene 4 contains more than half of Shakespeare's Scene 7, but ends before the king and Laertes have made their plans.

Scene 5 coincides with Shakespeare's Scene 5 in outward appearance, but contains many changes. Throughout the episode of the uprising Hamlet is given the lines usually attributed to Laertes and it is he who leads the soldiers and sailors into the palace. Scene 6 is an interpolation, in which Laertes and Claudius discuss their plans when the news of Ophelia's death is brought by the queen. The last part of Shakespeare's Scene 7 is utilized here, though there are numerous slight changes and additions.

Scene 1 of Act 5 opens with the customary grave-digger scene and continues to the appearance of the funeral procession, when Hamlet speaks the lines, "O treble woes," while Laertes replies, "What is he whose grief bears such an emphasis," to which Hamlet again answers: "This is I, Hamlet, the Dane!" The troublesome lines, "'Swounds, show me what thou'll do," are cut and the scene continues to the end.

The first eighty lines of Scene 2 are omitted by Hauptmann because the audience has long been familiar with the events

related there. Instead, Hamlet appears alone, speaking the monologue "To be or not to be," followed by a meeting with Horatio, Marcellus and Bernardo, during the course of which Hamlet thanks them for their help and in most eloquent and poetic lines Hauptmann characterizes Hamlet and his inability to carry out the ghost's command. The dialogue between Hamlet and Osric is cut considerably and the action continues to the end with only minor changes.

In Hauptmann's version the appearance of Hamlet at the head of the rebellious mob may seem basically wrong and incompatible with the central problem of the drama: Hamlet's inability to act. Throughout the play Hamlet strives to carry out the ghost's command, but is unable to shake off the lethargy which has befallen him. He castigates his procrastination and puzzles over the delay, but merely exhausts himself in words. The few flashes of activity, the killing of Polonius, the falsification of the letters to England, and the stabbing of the king, are unpremeditated. Whenever there is no time for lengthy deliberations and the subsequent conflict between will and moral law, Hamlet shows moments of passionate revenge. In view of these words,

> Thus conscience does make cowards of us all,
> And thus the native hue of resolution
> Is sicklied o'er with the pale cast of thought,[3]

can Hamlet lead the uprising and demand his rights from Claudius?

The interpretations in the first three acts have stressed only two things, the people's love for Hamlet and Horatio's efforts to precipitate an uprising. It is Horatio and not Hamlet who really has planned the challenge to the king; he and not Hamlet has enlisted supporters. At the first glance we may easily be misled by the bold approach of Hamlet, but upon a closer examination of the text his character has not changed; he is not the real leader. Horatio is the master and Hamlet only his instrument.

For a few moments in facing his uncle, Hamlet reaches another peak — the highest by far — again an attempt to fulfill the ghost's commands, but ending quickly as a shortlived and spasmodic

[3] III. i. 83–85.

outburst. Furthermore, it is no premeditated or skilfully worded accusation; Hamlet is brought into the king's presence through Horatio's aid and has caught the sudden enthusiasm of the mob. He is unprepared for this encounter and after his passionate cry, "O thou vile king, give me my father!" we anticipate action. At this critical and highly dramatic moment mad Ophelia appears and the sight of her disarms Hamlet forever. The thoughts and recollections of his love for her, whose sad fate must weigh heavily upon his sensitive nature, overwhelm and disarm him. Once more activity has become paralyzed by reflection. Claudius is at his mercy, but Hamlet hesitates and is helpless. His will is broken, he loathes the world and wishes only for death. Hamlet's walk through the cemetery in the following act is a very natural result of his state of mind. When he next appears, he speaks the monologue, "To be or not to be." Its position so late in the drama naturally causes some surprise. For Hauptmann the speech is clearly a discussion of the reasons for and against suicide [4] and has, therefore, a very logical position at the moment when Hamlet is weary of strife, anxious to leave the world.

Horatio, who has the stability which Hamlet lacks, grasps the situation quickly and urges rapid action before Claudius becomes master of the situation, but his plea falls upon deaf ears. Hamlet is unable to go on. The final scene of the duel at court presents nothing new. Of course, Claudius is unaware of his victory; he does not understand Hamlet's nature sufficiently to know that his will has been broken. Instead, Claudius, who cannot feel secure until he knows Hamlet is dead, is preparing for the duel and ensnares himself as well as his queen. Thus Hamlet finally becomes his father's avenger through the king's treachery rather than through his own will.

Concerning the changes in the graveyard scene, when Hamlet first jumps into the open grave and speaks the lines usually attributed to Laertes, Hauptmann pleads that the lover, beside

[4] Bradley also considers this soliloquy merely a debate upon suicide in which Hamlet is not thinking of the duty laid upon him. That Hamlet was seriously considering suicide is borne out by his first soliloquy, "Or that the Everlasting had not fixed his canon 'gainst self-slaughter!"

himself with grief and a feeling of guilt, would be more apt to express himself so violently than the polished courtier who has been accompanying his sister's body to the churchyard. It is, perhaps, in keeping with the extravagant and imaginative phrases that Hamlet uses in his soliloquies to vent his feelings.

Hauptmann discusses in his critical essay the vague and indefinite relationship between Hamlet and Ophelia and is justified in the criticism that the situation is undeveloped. It is extremely uncertain, however, that his suggestion for a Romeo-Juliet balcony scene would carry out the original intentions of Shakespeare. A balcony love scene could add nothing to the solution of Hamlet's particular problem. Furthermore, nothing indicates that Hamlet is seriously in love with Ophelia. The forlorn lover, "with his doublet all unbraced, no hat upon his head, his stockings fouled," was an old stage convention of the day that Shakespeare may have accepted without any serious consideration. The source material and the current version stressed the unhappy love relation and Ophelia's subsequent madness, so that it was an integral part of the tragedy. Nowhere in Hamlet's most secret thoughts, expressed in his soliloquies according to Elizabethan stage conventions, does he mention a deep passion for Ophelia. Only at her grave does he voice his love in extravagant words. Under those circumstances the opportunity for a highly dramatic episode would be sufficient justification for Shakespeare. But Hamlet's feelings may easily be considered a sweet, tender affection, a light-hearted fancy of his youth instead of a deep passion like Romeo's. Shakespeare was not writing tragedies of love at this time, but tragedies of thought; neither *Julius Caesar* nor *Measure for Measure*, both of this period, depends upon a love story for dramatic development. The Hamlet-Ophelia story came ready-made into Shakespeare's hands and was neither developed nor systematically motivated. Nowhere is there any definite evidence that Hamlet's cruelty, which was really the first sign of his "antic disposition," was the direct cause of her madness. To be sure, her songs are masterfully chosen to indicate erotic madness, but her suicide may be only a convenient and conventional device for removing a secondary character.

In Hauptmann's version the character of Laertes lacks the violently rebellious quality because the scene of the uprising has been completely reconstructed. It is Hamlet and not Laertes who rushes in with the cry, "O thou vile king, give me my father!" Certainly that line fits into Hamlet's mouth and becomes vastly more effective. Similarly, the speech "That drop of blood that's calm" [5] gains in meaning if these words come from Hamlet. Laertes' mother has never been mentioned in the entire text and is of no interest to the audience, but the ghost has placed the duty upon Hamlet to punish the king and save his mother's honor. Hauptmann emphasizes the point that the lines "even here, between the chaste unsmirched brows of my true mother" have significance only if the person is present.[6]

Hamlet can lead the uprising because of his position; he is the son of the former king and has the respect and love of many Danes, so that even Claudius fears his influence with the people and tells Laertes:

> The other motive
> Why to a public count I might not go,
> Is the great love the general gender bear him,
> Who, dipping all his faults in their affection,
> Would, like the spring that turneth wood to stone,
> Convert his gyves to graces; so that my arrows,
> Too slightly timbered for so loud a wind,
> Would have reverted to my bow again
> And not where I had aimed them.[7]

But what hope of gaining the throne of Denmark has Laertes? He is an elegant courtier, enjoying the full favor of Claudius as shown by these lines:

> What wouldst thou beg, Laertes,
> That shall not be my offer, not thy asking?
> The head is not more active to the heart,
> The hand more instrumental to the mouth,
> Than is the throne of Denmark to thy father,
> What wouldst thou have, Laertes? [8]

[5] IV. iv. 113–116.

[6] Hauptmann at this point adds the stage direction: "He presses his finger on her forehead."

[7] IV. vi. 16–24.

[8] I. ii. 45–49.

He has only one wish — to return to France as quickly as possible. Why should he accuse the king, utter treason, and run the risk of the gallows because his father had been killed accidentally? Laertes could have no following among the people; he was virtually a stranger at home since he spent all his time in Paris. Nor would Claudius address a young upstart at court who has attempted an uprising with such words:

> Go but apart,
> Make choice of whom your wisest friends you will,
> And they shall hear and judge 'twixt you and me.
> If by direct or by collateral hand
> They find us touch'd we will our kingdom give,
> Our crown, our life, and all that we call ours,
> To you in satisfaction. But if not,
> Be you content to lend your patience to us
> And we shall jointly labour with your soul
> To give it due content.[9]

There is no reason for Claudius to promise the kingdom to Laertes, but Hamlet does feel that he has lost the throne through his uncle. In the clearest statement of his grievances against the king he says:

> Does it not, think'st thee, stand me now upon —
> He that hath kill'd my King, and whored my mother;
> Popp'd in between the election and my hopes;
> Thrown out his angle for my proper life;
> And with such cozenage — is't not perfect conscience
> To quit him with this arm? and is't not to be damn'd
> To let this canker of our nature come
> In further evil? [10]

Furthermore, Hauptmann raises the point whether Laertes, once started upon his course, risking his life to attain a throne like a bold adventurer, would then allow himself to be thwarted so easily in his purpose and to be used as a tool to murder Hamlet treacherously? That raises, of course, the entire problem of Laertes' character. Is there anything in the first half of the play to brand him a low scoundrel capable of such misdeeds? The generally accepted belief that Laertes was a low fellow and morally corrupt seems unfair. His advice to his sister (I. iii) was

[9] IV. v. 197–206. [10] V. v. 63–70.

well-intentioned and good. There are no indications of his own moral corruption and his behavior in France was probably not below Elizabethan standards for a young courtier. But his treacherous plan to kill Hamlet with a poisoned foil conflicts with his general character and Hauptmann, therefore, introduces a slight variation that places the onus upon the king. Laertes wishes to challenge Hamlet to a duel "auf Tod und Leben." The king mentions the sharp rapier and suggests anointing it with poison.

Another problem which Hauptmann discusses pertains to the relation of the queen to Hamlet. He says: "The great scene in the closet with Hamlet permits only of surmises concerning the question how far she was aware of Claudius' crime. She was untrue to King Hamlet. That the ghost reveals. Where are her pangs of conscience, her hesitation, her suspicions, her reflections, which finally make her loathe her husband and bring her on the side of his enemies?"

Of course Hauptmann is mistaken in claiming that the queen is finally on Hamlet's side. The accepted version of Shakespeare's text leaves this problem completely in the dark. It is a clever stroke of Shakespeare's genius which makes an entirely new character of the queen. She is guiltless so far as knowledge of the murder is concerned and is of a weak and sensual nature, but by no means criminal. Hauptmann is misled in his remark by the fact that the source material, the story according to Saxo Grammaticus, lets Hamlet reveal the king's guilt to the queen and together they plan their revenge. Even in the First Quarto Gertrude promises aid to Hamlet and becomes his active ally. In making this change Shakespeare raised the queen beyond mere villainy, but at the same time he sacrificed something of the dramatic development. The real purpose of the closet scene has been lost. Whereas formerly the queen joined Hamlet's forces and the action was furthered, Hamlet now merely reproaches his mother for her conduct and Polonius is killed accidentally.

In considering Hauptmann's *Hamlet* it is important to remember that the poet based his reconstruction of the text upon a deeply subjective reaction to Shakespeare. He dismisses the critical and historical problems of the Elizabethan stage and is

guided only by his firm belief in the supreme dramatic genius of Shakespeare. He makes coherent motivation the guiding principle, though Schücking [11] has conclusively shown that Shakespeare's method of dramatic treatment was always episodic and lacked the customary compact structure of the modern play. Hauptmann cuts the rambling speeches and low humor that detract from the dramatic unity. In judging Shakespeare's *Hamlet* a historical knowledge of the subject is vital. The actual plot came ready-made and deviates little from the source even in the First Quarto. But Shakespeare always took liberties with his material; he became interested in the character of Hamlet, developed the thought content of the drama out of all proportion to the plot, and neglected the political intrigue, which was once an important and well-known factor. Shakespeare's final conception of Hamlet was too complex; the character had outgrown the plot. That is the best explanation of certain irregularities and incongruities in the text. A comparison of Shakespeare and Hauptmann would be presumptuous, but the similarity of their methods of approach ought to be considered. Both of them can take current material and make something entirely new of it by developing it in a characteristic manner. Neither Shakespeare nor Hauptmann shows critical ability in the choice or development of his plots; they are primarily poets depending upon their creative genius. Hauptmann lacks feeling and understanding for the dramatic conventions of the sixteenth century and his attempt to cast new light upon the Hamlet problem is futile, but the treatment of the old material at the hands of a modern poet is interesting and highly illuminating.

The anachronisms that arose from Shakespeare's method of working went unnoticed in the theater; Elizabethan audiences saw nothing incongruous in the mixture of barbaric superstition and philosophic speculation; they loved elegance of phrase and ribald jest with equal ardor. Nor are the difficulties that Shakespeare critics have pointed out apparent to the casual reader. They are in part the result of revision, of change of emphasis in the development of the plot, and of the haste in which Shakespeare

[11] *Die Charakterprobleme bei Shakespeare.* Leipzig, 1919.

was forced to supply the stage with plays. It must never be forgotten that all the dramas from Shakespeare's pen were written for the theater and not the study. Even a modern audience watches Hamlet's fate, spellbound. In the theater we accept Shakespeare with no hesitation or doubt. Perhaps the only explanation still lies in Grillparzer's words: [12]

> But how does it happen that at a performance or a competent reading we are not in the least disturbed by these mistakes; that they impress us as nothing but superiorities? Shakespeare's reality is of course a reality of impression and not of analysis. The significance of arrangement, the force of his embodiment is so overpowering that we do not think of the possibilities because actuality stands before us. The gift of presentation in this degree has all the prerogatives of nature, which we must recognize even where we cannot understand them.

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[12] "Studien zur englischen Literatur," (Othello, 1849), *Grillparzers Werke* (Bong & Co.), 13: 284.

THE CUMULATIVE EXAMINATION

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EDUCATION has taken on a new meaning during the last generation. The theory of mental discipline or faculty psychology has been largely placed in the discard with other relics of old-time theories and methods. The stress of transfer values has increasingly given way to content values in the building of the curricula of our modern school activities. If it is assumed that this is a trend in modern education, it becomes necessary to develop a new type of teaching technique, one which will emphasize more definitely the correct values of the course given, whether this be in the intermediate, secondary or college levels of instruction.

Content material is characterized by containing many details which may fit into the spread of future human experiences. This fitting in comes about by virtue of the identity of the elements in that which is being learned and in the situation later coming into experience. This fact makes it necessary to change the examination technique in order to take care of the changed values in education. The average student is led to stress and retain the material which is put into the examinations, and the work gone over is recalled in the degree and time spaces demanded in the testing scheme used. The character and kind of learning are mainly determined by the check-up of the instructor. Directed learning is necessary for at least 85 per cent of our unselected students. It is only the upper 15 per cent who need little or no direction. Situated as we are in public instruction, in our undertaking to educate the entire citizenry, more and more attention is needed to provide the proper stimuli and direction for the learning process. There is a need, for most students, of some systematic follow-up in a way which will compel them to recall past items and areas of information. Education is cumulative in its

nature and grows by the process of activity. From the physiological basis for learning, exercise is necessary in order to strengthen the synaptic connections. Recall in the learning should be made at increasing time intervals and at times when there is some effort necessary to recall, if the greatest economy is to be had.

In a recent experiment with students in educational psychology it was found that after they had learned to the threshold twenty-five nonsense syllables associated with numbers and with no mind-set to retain or practice in recall, the lapse of memory was 50 per cent on the third day and 75 per cent on the seventh day. Two weeks later most of the neural connections had become dissolved. In another experiment the class learned to the threshold with a mind-set to retain twenty-five other nonsense syllables associated with numbers. In this test the lapse of memory was not so great. (See Fig. 17.) The conclusion drawn is, that

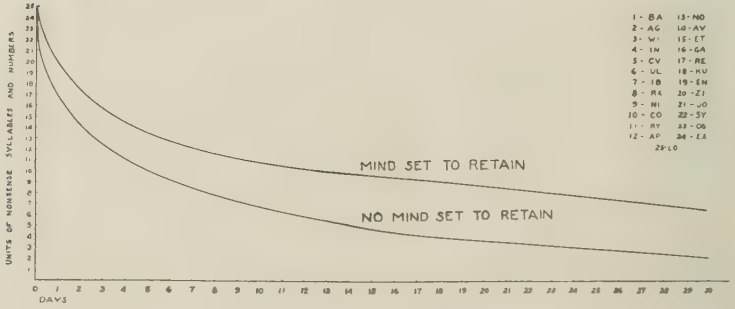

Fig. 17. Retention graph

with nearly the same effort on the part of the learner, much better results are obtained in the process of learning when the mind-set to retain is present. Most effective learning will take place when the type of teaching technique induces the will to remember. Frequent short examinations compel the student to learn with a mind-set to retain because it is known to him that the materials will be called for later.

After learning has taken place even to the point of overlearning,

if recall is not brought into action the materials learned soon fade from the memory. The operation of the law of exercise is necessary so that retention may be had. Figure 18 represents learning as it normally fades from memory; also, how through

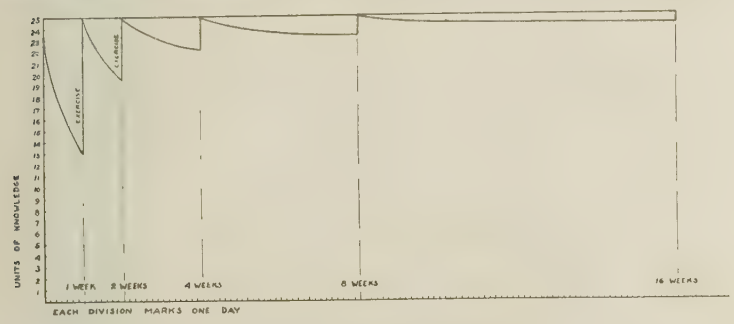

Fig. 18. Exercise graph of retention curves

exercise it is brought back to the threshold again and by more or less of a seasoning process, till, after several properly time-spaced recalls, retention becomes quite complete.

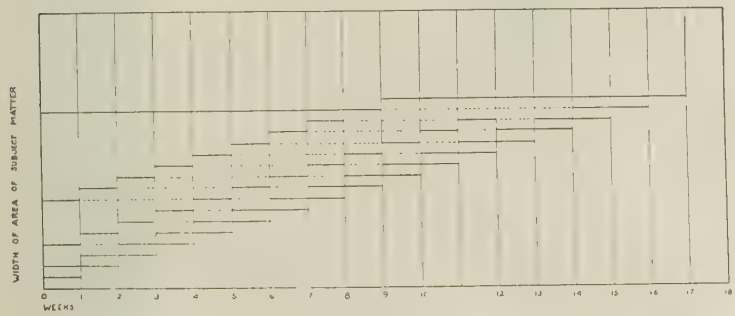

Fig. 19. Graph showing recall and examination distribution

Figure 19 shows a systematic plan whereby the examinations may be given to cover the different units of subject-matter in properly spaced time intervals in order to bring about the maximum amount of retention by the least number of periods of

recall. Tracing the horizontal heavy lines from left to right, counting from the bottom of the figure, it will be noted that the first examination reviews the work of the first week, the second one reviews the second and first weeks, the third reviews the third and second, the fourth examination reviews the fourth, third and again the first week, etc.

The plan is cumulative, always holding by a systematic recall all major and minor principles. By keeping up this schedule of testing the final examination becomes unnecessary. Furthermore, a student's standing can be struck off at any time. When the end of the semester or term period is reached the work will all have been tested and at the same time learned in a cumulative, growing way, so that it has become an integral part of the student's mental furniture and not an appendage of cramming which will atrophy in a day or two and fall off. The writer is reminded of the fable of the man who carried a calf around the city every day till the animal was full grown. This represented a great physical accomplishment. A psychic accomplishment of greater importance can be executed by making education a cumulative process of growth through proper activities.

The cumulative examination aims to capitalize on the laws of growth in learning. The new knowledge figures as a blessing twice in that it is a blessing in itself and in turn gives more meaning to the old knowledge with which it has become related.

Since the transfer of training takes place most completely when there are identical elements present, new knowledge must be such that it can be used when a similar setting or situation occurs. Much detailed information must be built up and retained by the use of the law of exercise during the progress of the school time. The ledger account of the student must be kept rather accurately if the accumulation of his term's work is to be used as indicative of his learning progress.

The trend of present-day educational methods is to make use of the social group more and more for the purposes of motivation and grading. There is the possibility of a stronger drive for excellency coming from the social group than from the teacher if this drive is properly capitalized. In times past the

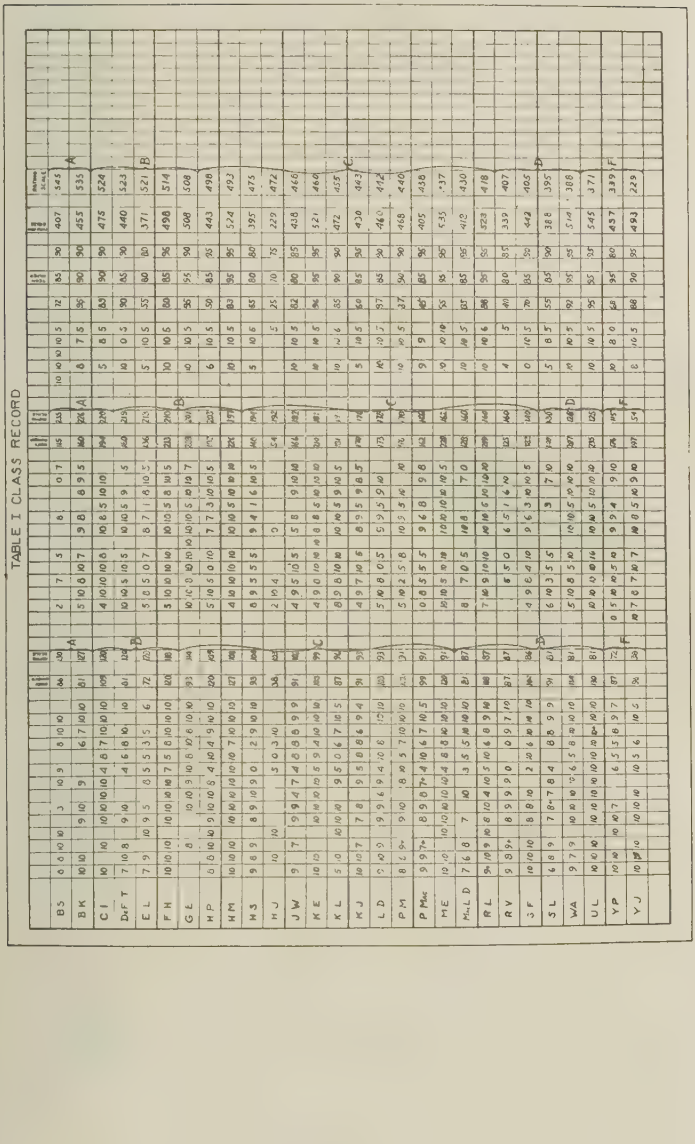

Fig. 20

study of the individual received the force of attention apart from the social group, but now we recognize the social group to be quite as important as the individual.

Table I (Fig. 20) shows a complete record of one group taken from the writer's class book. Usually each day, instead of the formal roll call, a question or two were given, one taken from the lesson for the day and one in review. Sometimes the questions were objective and at other times subjective. The examinations aimed to keep up a systematic recall as well as a test on the daily preparation. Occasionally a twenty-minute or thirty-minute examination was given. All grades were entered for each student, some tests being given on the basis of five, ten, twenty, twenty-five and even one hundred points, according to the amount of content to be covered in the examination. Problems and written work of all kinds were given a value in terms of the excellency shown. A comparison of the cumulative grades of the students could be had at any time by adding up their entries. These cumulative entries or grades became the students' index numbers by which they were enabled to find their position on the rating scale, which is made up of all the cumulative grades of the group, arranged in descending number values from the highest to the lowest in the group. At intervals during the semester each student was given a slip of paper upon which was written his name, together with his respective cumulative grade. The rating scale was placed on the board and only the student who checked his number by the rating scale knew his position relative to the whole group.

There is always a marked difference in the interest and drive in the group after the index numbers go out. Those students who rank high in the group are most eager to hold their position of rank and those ranking lower become aroused and make real competition with the ones above them. The members of the social group put a different meaning into a contest when they themselves are the contestants.

The index numbers are distributed on a normal curve of distribution, a five-class division being used on a 7, 21, 44, 21, 7 ratio. At the end of the semester all who have index numbers

placing them in classes A, B and C on the rating scale need not take the final examination. However, if any student wishes to go into it to raise his grade he must take his chance of lowering his grade as well as raising it. All placing at D or F must be examined. Under this arrangement about 75 per cent of the class get through on their cumulative grades.

Supplementary to the cumulative grades the writer has found it very convenient to keep for each student a large filing envelope in which are placed all make-up work and special kinds of work done in excess of class work done during the semester. In determining the final grades the contents of these envelopes sometimes give considerable weight.

CONCLUSIONS

1. Retention is best when the learning is done with a strong mind-set to retain.
2. When mental images begin to fade recall should be used to bring them back again.
3. The best results come from recall when the time intervals for exercise are properly spaced.
4. Examinations can be so planned that education can be placed on a growing basis rather than on a cramming one.
5. The strongest drive for recalling comes from the individual when he interacts with the group.
6. Final examinations are not necessary for 75 per cent of the group.
7. The cumulative score is a just basis for distributing grades.

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THE INFLUENCE OF THE LENGTH OF A TRUE-FALSE TEST UPON THE PROBABILITY OF HIGH SCORES BY GUESSING

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THIS study attempts to determine experimentally the influence of the length of a series upon the percentage of correctness in "true" and "false" answers.

Series of 4, 10, 20, 30, 40, 50, 100, 200 and 340 items were used in the following manner. Instead of furnishing the subject with a series of positively or negatively worded statements, as is usually done, we had him put his "true" or "false" answers after serially numbered lines. It was thought that worded statements might influence the choice of answer, whereas a numbered line could not furnish a clue to the likelihood of the truth or falsity of an item. For example, in the series of 10 items the subject was given a sheet having 10 lines numbered serially from 1 to 10.

The subject was asked to imagine that he was writing a true-false test on an assignment and each line was to represent a statement concerning the assignment. He was to think of himself as totally unprepared for that day and the material, therefore, was to be thought of as absolutely unknown to him. Consequently, he knew nothing concerning the truth or falsity of the statements, and thus was forced to give answers of either "true" or "false" by guessing. One group of subjects was requested to write the answers "true" and "false" in random order, without any conscious attempt to count the frequency of the "true's" or "false's," or to use any system by which the choice of answer might be determined. A second group was asked to mark 50 per cent of the guesses as "true" and 50 per cent as "false," by putting down in some random order one half of the answers as "true" and by filling in the remaining blanks with "false."

TABLE I

TABULATIONS OF PERCENTAGES OF ITEMS GUESSED CORRECTLY

R[1] — This class interval contains the range of items included.

C[2] — These percentages are based upon scores obtained by random guessing.

H[3] — These percentages are based upon scores obtained when the subject guessed 50 per cent as "true" and 50 per cent as "false."

Series of 4, 10, 20, 30, 40, 50 and 100 items involved 250 subjects; the 200 items, 200 subjects; and the 340 series, 150 subjects.

Percentage of the entire series	4 items			10 items			20 items		
	R[1]	C[2]	H[3]	R[1]	C[2]	H[3]	R[1]	C[2]	H[3]
1–10	0	6.8*	17.6*	1	1.6	2.0	1–2	....	....
11–20	..	.....	.....	2	3.2	4.4	3–4	....	0.4
21–30	1	24.0	.....	3	10.8	12.4	5–6	7.2	4.8
31–40	..	.....	.....	4	20.0	17.2	7–8	14.0	24.0
41–50	2	37.6	64.8	5	27.2	27.2	9–10	35.6	30.0
51–60	..	.....	.....	6	22.4	19.2	11–12	31.2	26.8
61–70	..	.....	.....	7	10.0	11.2	13–14	10.0	10.8
71–80	3	24.8	.....	8	4.4	4.4	15–16	2.0	2.8
81–90	..	.....	.....	9	0.8	2.0	17–18	....	0.4
91–100	4	6.8	17.6	10	....	....	19–20	....	....

* This class interval contained a frequency of 0 items; therefore 0 per cent.

Percentage of the entire series	30 items			40 items			50 items		
	R[1]	C[2]	H[3]	R[1]	C[2]	H[3]	R[1]	C[2]	H[3]
1–10	1–3	....	....	1–4	....	....	1–5	....	....
11–20	4–6	....	....	5–8	....	....	6–10	....	....
21–30	7–9	4.0	3.6	9–12	0.8	2.0	11–15	0.4	0.4
31–40	10–12	11.6	12.4	13–16	13.2	12.4	16–20	6.8	10.4
41–50	13–15	40.4	39.6	17–20	44.0	44.0	21–25	48.0	44.4
51–60	16–18	34.4	33.2	21–24	34.0	34.0	26–30	39.2	39.6
61–70	19–21	9.6	10.0	25–28	8.0	6.8	31–35	5.2	4.8
71–80	22–24	....	1.2	29–32	....	0.8	36–40	0.4	0.4
81–90	25–27	....	....	33–36	....	....	41–45	....	....
91–100	28–30	....	....	37–40	....	....	46–50	....	....

Percentage of the entire series	100 items			200 items			340 items		
	R[1]	C[2]	H[3]	R[1]	C[2]	H[3]	R[1]	C[2]	H[3]
1–10	1–10	....	....	1–20	....	....	1–34	....	....
11–20	11–20	....	....	21–40	....	....	35–68	....	....
21–30	21–30	....	....	41–60	....	....	69–102	....	....
31–40	31–40	2.8	1.2	61–80	....	....	103–136	....	....
51–40	41–50	48.0	49.6	81–100	50.5	54.0	137–170	52.7	57.3
51–60	51–60	46.4	46.8	101–120	49.5	46.0	171–204	47.3	42.7
61–70	61–70	2.8	2.4	121–140	....	....	205–238	....	....
71–80	71–80	....	....	141–160	....	....	239–272	....	....
81–90	81–90	....	....	161–180	....	....	273–306	....	....
91–100	91–100	....	....	181–200	....	....	307–340	....	....

TABLE II *

TABULATION OF PERCENTAGES FOR SERIES OF 200 AND 340 ITEMS IN CLASS INTERVALS OF FIVE PER CENT

Explanations for R[1], C[2] and H[3] are the same as for Table I.

Percentage of the entire series	200 items			300 items		
	R[1]	C[2]	H[3]	R[1]	C[2]	H[3]
41–45	81–90	4.5	7.5	137–153	2.0	1.0
46–50	91–100	46.0	46.5	154–170	50.7	56.3
51–55	101–110	43.5	37.5	171–187	44.7	41.4
56–60	111–120	6.0	8.5	188–204	2.6	1.3

* This Table was compiled to show more accurately the distribution of scores for the lists with 200 and 340 items. It will be noted that the scores for both series ranged almost entirely within 5 per cent above and below the mid-point, or 50 per cent mark, for the series.

For each of the series of 4, 10, 20, 30, 40, 50 and 100 items and for each method of guessing the groups totalled 250 subjects. For the series with 200 items 200 subjects were used; in the series

with 340 items 150 took part. All were undergraduate college students.

All papers were checked by means of a previously prepared key which contained the standard list of "true" and "false" items in equal proportions. Two sets of data were obtained. One tabulation showed the frequency of correct guesses among the random marking of answers. The other indicated the number of correct guesses when the subject limited his guesses to marking 50 per cent "true" and 50 per cent "false."

Table I contains sections for the lists of 4, 10, 20, . . ., items. The second column of each section tabulates the distribution of correctly guessed answers when the guessing was done at random, without any attempt to mark each series 50 per cent "true" and 50 per cent "false." The average frequency of correct guesses for each series was so close to 50 per cent that a "right minus wrong" score for the average would result in an approximately zero score. When the list was very short, such as 4 items to a series, individual scores varied greatly from the average, for many individuals received scores which showed 0 per cent or even 100 per cent of the entire series guessed correctly. For the series of 10 items, the distribution of scores ranged from almost 0 per cent to almost 100 per cent guessed correctly. As the series increased in number of items, the range of the distribution decreased, so that, with a test of 200 items, all scores ranged from 41 to 60 per cent correct guesses. With the series of 340 items, practically all the scores ranged within 45 to 55 per cent correct answers. (See Table II.)

Substantially the same results were obtained for the group which marked one half of the guesses "true" and one half "false." (Note the third columns of the sections of Table II.) Again, the short series yielded a wide range of scores, whereas the long series usually had all the scores within 5 to 10 per cent above or below the 50 per cent mark. Thus it made no difference whether the guesses were consciously distributed so that 50 per cent were guessed as "true" and the others marked as "false," or whether the subject marked the items at random. (Compare the third column of each section with the second one.)

CONCLUSIONS

On the basis of the data obtained it may be concluded that a true-false test should have more than 20, or even 50, items to avoid unduly high scores from successful guessing the "right minus wrong" method of scoring is applied.

It was also evident that a test of 200 to 340 items almost precluded the probability of obtaining high scores on the basis of guessing only. Most of the experiments conducted with a view of testing the validity of the "right minus wrong" method used tests of considerably fewer than 200 items, and therefore many scores would be high in spite of the fact that the subjects were guessing and knew nothing of the subject-matter upon which they gave judgments. One may safely state that a valid true-false test should have at least 200 items.

The longer a true-false test is, the more likely the "right minus wrong" method of scoring it will give credit adequately.

It made no difference in distribution of scores whether the subjects wrote their guesses of "true" and "false" at random, or whether they divided the guessed answers into 50 per cent "true" and 50 per cent "false."

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A SURVEY OF PIN-POINT COLONIES FOUND IN THE ROUTINE MILK EXAMINATIONS OF A CITY MILK SUPPLY

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ALL laboratory workers who make plate counts of milk according to the standard methods of the American Public Health Association and Association of Official Agricultural Chemists (7) are familiar with the sporadic appearance of large numbers of surface and subsurface, punctiform bacterial colonies — the so-called "pin points."

From the literature it appears that the recognition of these colonies is relatively recent and dates approximately from the period following the World War. At the present time the factors suggested by various authors as responsible for pin points may be classed under (*a*) variations in laboratory technic, (*b*) overcrowding of colonies on plates, and (*c*) colony-type characteristic of specific types of organisms.

The explanation of pin points has assumed especial importance because of its bearing on the interpretation of the standard plate count. Since plate counts play so important a part in judging the quality of raw milk, the efficiency of pasteurization and the quality of the milk delivered to the consumer, the interpretation of enormous counts due to pin points becomes a real problem.

There has been a tendency among many workers to minimize the importance of pin points. Ward (9) would ignore them as being of no importance. "Some have even advised the use of culture media on which such colonies would not grow and to pretend that they did not exist" (6). Norton (4) has suggested that pin points should be counted, but that such counts should not be used to measure the sanitary quality of the milk. Harding and

Ward (3) report that, since the presence of pin points does not appear to affect either the commercial or the sanitary quality of milk, there should be a standard, other than the number of bacteria present, for judging the quality of milk.

On the other hand, Prucha (5) and Fay (2) have concluded that if milk contains large numbers of organisms, regardless of whether or not they are pin points, it indicates that the milk has not received proper attention somewhere along the way between the cow and the consumer. In the laboratory of the Michigan Department of Health it has always been the practice to include all visible colonies in the standard plate count. Since July, 1928, to facilitate the interpretation of the reports by the city milk inspectors, a notation has been made to indicate a count comprised largely of pin points.

Because of the wide divergence of opinion concerning the problem and because of its significance locally, it seemed worth while to make a survey of the pin points that appear in the routine milk examinations. The available material for this seemed especially good because of the variety of types of milk plants under laboratory control, the various grades of milk sold, and the sincere coöperation of the city milk inspectors.

A survey was made, therefore, to determine whether the appearance of pin points was subject to a seasonal variation, what was the type — or types — of organisms responsible for pin points, and whether there was any correlation between the laboratory findings and the results of plant inspection. Such a study received a special stimulus in December, 1929, because of the unusually large number of pin points encountered.

DATA

Material for survey. — The milk supply under laboratory control is furnished by 48 pasteurization plants that supply pasteurized milk to 64 dealers, 17 grade A raw milk dealers and 1 certified dealer. In general, 4 specimens of whole milk, 1 of cream and 1 of chocolated milk, and an occasional empty bottle, are examined each month in the laboratory. With the exception of the empty bottles, the specimens, which are collected from retail wagons,

are brought to the laboratory iced and the first plates are usually poured within 30 minutes after arrival.

Standard methods (7) are followed for all specimens except the empty bottles. The bacterial content of these is determined by adding a known amount of sterile distilled water to the empty bottle and plating 1 mil of this water in duplicate. All plates are incubated at 37° C. for from 36 to 48 hours and counts are made with a Buck colony counter, which uses a lens that magnifies two and one-half diameters.

Seasonal distribution of pin points. — Since Swenarton (8) has reported that pin points are more numerous at certain seasons of the year, the first work was to check over our records from this point of view. The percentage of the total number of raw and pasteurized specimens showing pin points was calculated. Table I gives the figures obtained from standard plate counts by months from July, 1928, to March, 1931.

TABLE I

Summary of Seasonal Distribution of Pin-Point Colonies that Formed on Routine Agar Plates from July, 1928, to March, 1931

Month	1928			1929			1930			1931		
	Total specimens	Pin-point plates	Percentage of pin-point plates	Total specimens	Pin-point plates	Percentage of pin-point plates	Total specimens	Pin-point plates	Percentage of pin-point plates	Total specimens	Pin-point plates	Percentage of pin-point plates
Jan....	...	..	...	420	6	1.4	430	41	9.5	395	8	2.1
Feb....	...	..	...	440	2	0.4	410	18	4.4	355	7	1.9
March.	...	..	...	470	11	2.4	450	2	0.8	...	..	...
April..	...	..	...	470	11	2.4	380	1	0.2	...	..	...
May..	...	..	...	460	1	0.2	415	0	0.0	...	..	...
June..	...	..	...	490	6	1.3	370	2	0.5	...	..	...
July...	350	10	2.2	360	1	0.3	370	8	2.2	...	..	...
Aug...	320	14	4.3	430	6	1.4	280	5	1.9	...	..	...
Sept...	440	8	1.8	370	9	2.5	430	3	0.6	...	..	...
Oct....	415	11	2.5	310	9	2.9	410	3	0.7	...	..	...
Nov...	415	8	1.9	450	14	3.1	360	4	1.1	...	..	...
Dec...	395	4	1.1	430	11	2.5	380	6	1.5	...	..	...

The figures in Table I are based upon 2,335 standard plate counts in 1928, 5,100 in 1929, and 4,685 in 1930. For the first

two months of 1931 the total is 750. Analysis of the data reveals no definite correlation between periods of high frequency of pin points and the season of the year.

Distribution of pin-point colonies with regard to kind of sample and number of dealers. — That organisms producing pin points are not a rarity in the city milk supply is shown by Table II.

TABLE II

Distribution of Pin-Point Plates from Various Sources

Material examined	Dealers		Samples		
	Total	No. with pin-point samples	Total	Pin points found	
				Number	Per cent of total
Pasteurized milk.	64	17	880	33	3.75
Raw milk.....	17	12	225	15	6.66
Cream.....	55	4	180	4	2.22
Empty bottles...	13	3	26	3	1.15
Chocolated milk..	38	2	127	2	1.57
Totals.....			1438	57	3.96

As indicated by the data summarized in this table, of 880 pasteurized milk samples, 3.7 per cent showed pin points; of 225 raw milk samples, 6.6 per cent; of 180 creams, 2.2 per cent; of 26 empty bottles, 1.1 per cent, and of 127 chocolated milk samples, 1.5 per cent showed pin points. Of the 82 dealers furnishing 1,438 samples, 50 had no samples with pin points. The 57 samples showing pin points were distributed among 32 different dealers.

Types of organisms giving pin-point colonies. — For a study of the type or types of organisms that produce pin points, cultures were collected from pin-point plates in routine milk analysis from December 15, 1929, to March 7, 1930. From agar plates representing a total of 57 specimens, 272 pin-point colonies were fished and inoculated into litmus milk. Of the 272 colonies fished, 161, or 68.9 per cent, grew. This point is mentioned since it must be taken into consideration that the data are based upon only 68.9 per

cent of the colonies actually selected. These 161 cultures were studied in regard to morphology, chromogenesis, motility, gelatin liquefaction, nitrate reduction, carbohydrate utilization, litmus milk reaction, oxygen requirements and their reaction to a pasteurization temperature of 62.8° C. The various tests were made according to the technic outlined in the *Manual of Methods of the Society of the American Bacteriologists.* It may be briefly stated that the results of these tests were very similar to those obtained by Ayers and Johnson (1) in their study of 322 cultures. It should be noted that, after isolation and first subculture, only 3 of these cultures kept the pin-point colony form. The others proved to have colonies of larger size under the new conditions of culture.

With respect to the effect of a pasteurization temperature of 62.8° C. for 30 minutes on these cultures, 9 appeared to be thermophilic, 3 thermoduric, and 149 were killed. Of the 9 thermophilic organisms, 2 were streptococci from pasteurized milk and 7 were spore-forming rods, of which 5 were isolated from pasteurized milk and 2 from raw milk. The 3 thermoduric organisms were micrococci isolated from raw milk.

The relative incidence of the various morphological types of organisms from 161 cultures was as follows:

Spore-forming rods	90	55.3%
Streptococci	39	24.2%
Micrococci	28	11.1%
Sarcina	3	0.18%
Actinomyces	1	0.05%

Correlation of laboratory findings and plant inspection. — From the practical side, the really important thing to be determined about pin points is whether or not they are of significance in indicating poor plant methods and a poor raw supply. It would seem almost impossible, at times, to obtain an accurate answer to such a question. A most obvious difficulty is that by the time the laboratory report is received, the inspector must look for conditions which existed at least 48 hours previously. However, the answer must eventually be found in the closest coöperation between the laboratory, milk inspector and milk plant.

In the present survey such an attempt at correlation was

made possible by the real interest of the milk inspector in the problem and his hearty coöperation. Upon receipt of a laboratory report of pin points, he immediately investigated the milk plant involved. Particular attention was paid to discovering weak points in plant methods and poor raw milk supplies.

In studying plant methods the inspector looked for such things as improper cleansing and sterilization of equipment; the presence of dead ends or leaks; delays in the plant operation that caused heated milk to be held at pasteurization temperature longer than 30 minutes; lack of refrigeration and repasteurization of returned milk.

In searching for the causes of a poor raw supply, such factors as improper cooling at the farm or during transportation and inadequate cleansing and sterilization of milking machines, cans and other equipment were considered. When findings indicated a poor raw supply, samples were collected for examination at the laboratory for the presence of thermophiles and other organisms that form pin points.

The plants of 30 dealers whose milk had given high pin-point counts were inspected with unusual care. Eight of these were in excellent condition. In the remaining 22 plants, 6 had a poor raw supply and 16 showed poor plant methods coincidental with the high pin-point counts. Of these 16, improper sterilization was demonstrated in 5, standardization with poor warm skim in 4, dirty equipment in 3, pasteurization delays in 2, repasteurization in 1 and lack of refrigeration in 1.

The milk samples from one dealer whose counts on pasteurized milk had been consistently below 10,000 showed a sudden and enormous increase in bacterial count of the pin-point type. Inspection revealed that, faced with a temporary shortage of milk, he had contracted with a neighboring condensory for their excess. After the condensory supply was shut off, the counts immediately returned to normal.

In another instance the eight specimens over a period of one month from a dealer showed pin points. There was reason to suspect that this dealer was repasteurizing and inspection revealed such poor plant methods that the milk inspector threatened to shut

down the plant. There was an immediate and marked improvement in plant methods and at the same time a complete disappearance of pin points.

SUMMARY AND CONCLUSIONS

A general survey was made of the pin-point colony findings in the routine milk samples from 82 dealers over a period of about two and one-half years, and a more intensive survey of the findings over a period of about three months — December 16, 1929, to March 7, 1930.

The presence of pin-point colonies did not seem to be dependent upon the season of the year.

No one type of organism was found responsible for pin-point colonies. In the 161 cultures studied the types in order of their frequency were: spore-forming rods, streptococci, micrococci, sarcina and actinomyces.

Most of the cultures isolated from pin-point colonies did not retain their pin-point character of colony after isolation and subculture.

Pin-point colonies were found in raw milk oftener than in pasteurized milk. The findings suggest that when pin points are present in pasteurized milk, the true source of the organisms is ordinarily the raw milk.

The appearance of pin-point colonies on routine agar plates often coincided with findings by the milk inspectors of either improper plant practices or a bad raw milk supply. This suggests the practical significance of laboratory findings with respect to pin-point colonies.

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CHARACTERISTICS OF A CERTAIN GRAM-NEGATIVE ORGANISM (CHROMOGEN 6) ISOLATED FROM THE NASAL CAVITIES OF ANIMALS (ALBINO RATS) SUFFERING FROM WITHDRAWAL OF VITAMIN A

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EXPERIMENTAL evidence has clearly established that deficiency in vitamin A produced in the rat a pathological condition classified as xerophthalmia. Secondary to this condition is a lowered resistance of the animal toward infection, characterized chiefly by suppurations in the nasal passages, accessory sinuses, middle ear, lacrimal apparatus and upper respiratory tract. These facts have been observed by McCollum (5), Daniels (1), Drummond (2), Sherman (6), and Green and Mellanby (4).

Previous papers have been published by the author (7–9) on the bacteriology of the suppurative lesions encountered in animals (albino rats) suffering from lack of vitamin A. Three series of experimental animals have been studied, making a total of 214 rats. Fifty-four of these were controls, 19 stock, and the remainder animals deficient in vitamin A. During the course of this study a Gram-negative coccus has repeatedly been encountered. This organism has been grouped, according to the classification of Gordon (3), from its cultural characteristics, staining properties, morphology and sugar reactions 24 to 48 hours after its isolation from the rat. In a previous publication by the author (9) mention is made of the possibility of the relationship of this organism to staphylococci and of the controversy regarding the efficacy of the Gram stain. These statements are made because it was found that

several strains of organisms classified as chromogen 6, which were Gram-negative 24 to 48 hours after isolation from the rat, later became Gram-positive. Because of these observations a study was made of the characteristics of this organism.

A description of these characteristics is presented as based on a study of fifty individual strains. From the results of this investigation we are confident that the organism has a variable staining property. When first taken from the animal it is Gram-negative; later, after growth on artificial mediums, it is Gram-positive. Wilson and Smith (11), working with chromogenic organisms, point out the variable findings in colony characters and sugar reactions. If these are variable, is it not possible for the organism to show a variability toward the Gram stain?

Characteristics of chromogen 6 encountered in suppurative lesions of animals suffering from withdrawal of vitamin A are as follows:

Colony structure. — Description of the colony growth is made from its appearance on blood-brain-veal-agar plates after 24 hours' incubation. The colonies appear, by reflected light, as small, round and pearl-gray and have a diameter of about 2 mm. They have small distinct centers of a brown, varnish-like appearance that is most noticeable by transmitted light. At times this center is almost invisible by reflected light. Microscopically the colonies appear smooth, with even edges. No colonies of a rough type, as described by Gordon (3), have been encountered. Granulation is not detected. By transmitted light the colonies appear translucent, with small opaque centers. They are slightly convex, but microscopically they appear almost flat. They are readily distinguished from those of other staphylococci. On brain-veal agar the colonies are less gray and more transparent than is the case with blood mediums. On blood there is no hemolysis and the colonies do not appear to increase in size with age.

Cultivation. — The organism grows readily on common laboratory mediums. Growth takes place at room temperature, but is best at 37° C. Growth on potato is scant and of a light cream color. Gelatine is liquefied within 48 hours along the line of inoculation. Growth in dextrose broth is turbid, with a fine gray-

ish sediment. The organism is bile-insoluble. Twenty-four-hour growth in litmus milk appears to be typical for this organism, with coagulation and reduction in the butt of the tube and an acid ring at the surface. The organism shows poor growth in an atmosphere of Co_2.

Morphology and staining. — In smears from cultures or pus chromogen 6 appears most frequently in groups or clusters resembling that of staphylococcus. They may appear singly or in pairs. The organism is a small, spherical coccus having an average diameter of about 0.6 micron and is non-motile.

The Gram-staining reaction is variable. It is partially or entirely Gram-negative 24 to 48 hours after isolation from the animal. Occasional strains show elongated cells; the majority of organisms are Gram-negative, with several groups in the field a poor positive. After cultivation for 72 hours to 2 months the organisms are distinctly Gram-positive and entirely spherical. The length of time for this reversed staining characteristic to take place varies apparently with different strains. The majority of the organisms appear to change after 5 or 6 days' cultivation on artificial mediums, whereas some fail to take the Gram stain for 2 months or longer. This variable quality has been a subject of doubt since the beginning of this investigation on the bacteriology of infections occurring in the albino rat deprived of vitamin A. At the beginning of the investigation three years ago, Gram stains were made by staining with carbol-gentian-violet one-half minute, Gram's iodine one-half minute, followed by alcohol to decolorize, and 10 per cent aqueous saffranin solution applied for 20 seconds as a counter stain. Beginning with Series 2 Sterling's modification of the Gram stain was adopted. During the investigation of Series 3, reported in this paper, all Gram stains of coccus-like organisms were controlled with a smear from a known *Staphylococcus aureus* on the same slide. Thus the unknown organism and known staphylococci were always stained under like conditions. This enabled us to differentiate staphylococcus organisms and chromogen 6 as isolated from the rat. No organism was classified as chromogen 6 unless it stained distinctly negative in comparison with the positive control. Occasionally, poor positive

organisms were encountered. They were not definitely Gram-negative and were classified as Gram-positive.

Four strains of chromogen 6 were studied in order to determine whether the organism had a life-cycle which might account for the change in the Gram stain. Stains from 24-hour cultures on dextrose agar slants were made daily for a period of 4 months (January 28 to May 22). At the end of this time all four organisms were Gram-positive whereas, at the start, all four organisms were Gram-negative. The time for each organism to change from Gram-negative to Gram-positive varied from 4 days to 2 months. No cycle could be detected in any of the strains. After changing from Gram-negative to Gram-positive the organisms continued to stain positive and no definite indication of their returning to a true negative type could be seen during the 4 months. At times the coccoid forms appeared to be slightly elongated, as if swollen or degenerated. Later they would again assume the spherical shape. No consistency in regard to a definite time for this change in morphology could be demonstrated.

Experiments in staining were conducted on thirteen strains of various organisms isolated from the rat, and two known strains, one a Gram-positive staphylococcus and the other *B. coli*. The strains of chromogen 6 that were used (three) were young cultures and showed the negative characteristic. Smears were made of these organisms and given to two individuals for staining. Each strain was stained with four different stains, carbol-gentian-violet 7 months old, Sterling's carbol-gentian-violet freshly prepared, and a Sterling stain obtained from bacteriological laboratories of the Detroit College of Medicine and Surgery.

The results obtained gave evidence that there is a possibility of making an error in the Gram stain. By staining a control on the same slide such variations were watched and rechecked if signs of poor staining were noticeable. Time and again efforts have been made to obtain a positive stain on a 24-hour culture of the organism classified as chromogen 6, but with failure. Seventy-two hours or more after artificial cultivation, they would inevitably become Gram-positive.

It was thought that the type of culture medium or change in

hydrogen ion concentration might account for this change in the Gram staining, and that, if pH or different types of medium played a part in the interchangeable staining characteristic, the organisms now Gram-positive could be converted to the Gram-negative phase. Ten strains of chromogen 6 from our stock cultures were tested in dextrose broth, on brain-veal-agar, on plain agar plates and on brain-veal-agar with blood at pH values of 6.0, 7.0 and 8.0. Control plates of blood-brain-veal-agar pH 7.5, as employed in our routine work, were also tested. The organisms used for this experiment were stock cultures 5 to 8 months old and all were Gram-positive, although, when taken from the animals, they had been distinctly Gram-negative. A control strain of staphylococcus was also tested on these mediums at the different pH ranges. Results of Gram-staining were all positive in all mediums at pH concentrations of 6.0 and 7.0. Three strains of chromogen 6 stained a poor positive at pH 8.0 from plain agar. The other mediums at pH 8.0 showed distinct positive stainings for all strains tested. Thus it would appear that neither the pH value nor the constitution of the medium (plain agar, blood-agar or brain-veal-agar) is responsible for the negative staining of this organism when first isolated from the animal.

Inoculation tests were carried out in normal rats, guinea pigs and rabbits to determine whether animal passage would convert the organism to the Gram-negative phase. Three strains of chromogen 6 and a known control of *Staphylococcus aureus* were used for the inoculation tests. Rats and guinea pigs were injected intraperitoneally with 2 c. c. of 24-hour nutrient broth cultures. The rabbits received intravenous injections of 4 c. c. of broth cultures. Eight days later they were injected with another 4 c. c. of broth culture. The rats and guinea pigs were killed and autopsied 7 days after receiving the injections. The rabbits were killed and autopsied 3 days after receiving the last injection.

The results of this experiment gave evidence that the organism referred to as chromogen 6 did not affect animals as did the known strain of staphylococcus. Not one of the strains of chromogen 6 injected intraperitoneally was recovered. Evidently this organism does not thrive in the peritoneal cavity. Does it have an affinity

only for the nasal mucous membrane? Each animal injected with staphylococci developed an abscess at the site of injection. The organism thrived and was readily recovered from the abscess. Two of the rabbits injected intravenously with chromogen 6 showed the typical liver necrosis often seen at autopsy after injection of this organism. Necrosis of the liver has never been observed macroscopically after injection of staphylococci. This phenomenon seems to be typical of the organism described as chromogen 6.

Veillon and Zuber (10) describe a Gram-negative staphylococcus from fetid pus in cases of appendicitis, which they classify as *Staphylococcus parvulus*. Chromogen 6 is eliminated from this classification mainly because the parvulus strain produces gas in practically all the common sugars. Since no variable type of staphylococcus is mentioned in the literature and since the organism studied stains a definite Gram-negative within 24 to 48 hours after isolation from the animal, it is provisionally classified as chromogen 6.

SUMMARY

1. A description of the characteristics of an organism, referred to as chromogen 6, isolated from the suppurations in the nasal cavities of rats suffering from lack of vitamin A is given as based on a study of fifty individual strains.

2. The colony structure is characteristic of Gram-negative cocci of the upper respiratory tract.

3. The growth on common mediums is characteristic of Gram-negative cocci of the upper respiratory tract.

4. Fermentation of all common sugars without production of gas is characteristic of Gordon's chromogen 6.

5. The organism produces a typical reaction in litmus milk, with coagulation and reduction in the butt of the tube and an acid ring at the surface after 24 hours' incubation.

6. The organism does not retain the Gram stain when first isolated from lesions of the rat. This is typical of Gram-negative cocci. After 72 hours or more of artificial cultivation the bacteria retain the Gram stain and look very much like staphylococci.

7. Intraperitoneal or intramuscular injections of old or young cultures into common laboratory animals produce no lesions and the organism cannot be recovered. Staphylococci generally produce abscesses at the site of injection.

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